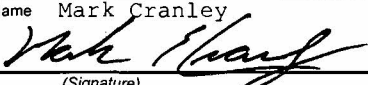


<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-01	
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number	
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Framework/Regional Application	
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 2e	
Period of Performance From 09/30/2012 To 09/29/2013		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:	
Comments: Please provide a Work Plan NLT 10/31/2012.			
<input type="checkbox"/> Superfund      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund			
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.			
SFO (Max 2) <input type="checkbox"/>			
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)
1			
2			
3			
4			
5			
Authorized Work Assignment Ceiling			
Contract Period: 09/30/2012 To 09/29/2013		Cost/Fee:      LOE:	
This Action:			
Total:			
Work Plan / Cost Estimate Approvals			
Contractor WP Dated:		Cost/Fee:      LOE:	
Cumulative Approved:		Cost/Fee:      LOE:	
Work Assignment Manager Name Britta Bierwagen		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number 703-347-8613	
		FAX Number:	
Project Officer Name Sharon Boyde		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number: 703-347-8576	
		FAX Number: 703-374-8696	
Other Agency Official Name		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number:	
		FAX Number:	
Contracting Official Name Mark Cranley		Branch/Mail Code: CP0D	
(Signature)  (Date) 10/16/12		Phone Number: 513-487-2351	
		FAX Number: 513-487-2109	

**TETRA TECH**  
**EP-C-12-060**  
**PERFORMANCE WORK STATEMENT**  
**Work Assignment 0-01**

**TITLE:** National Framework and Regional Applications of Climate Change  
Vulnerability Assessment for Monitoring in Rivers and Streams

<b>Work Assignment Manager (WAM)</b>	<b>Alternate Work Assignment Manager (AWAM)</b>
Name: Britta Bierwagen Office: ORD/NCEA/GCRP 1200 Pennsylvania Ave., NW (MC 8601P) Washington, DC 20460 Phone: 703-347-8613 Fax: 703-347-8694 Email: <a href="mailto:Bierwagen.Britta@epa.gov">Bierwagen.Britta@epa.gov</a>	Name: Susan Julius Office: ORD/NCEA/GCRP 1200 Pennsylvania Ave., NW (MC 8601P) Washington, DC 20460 Phone: 703-347-8619 Fax: 703-347-8694 Email: <a href="mailto:Julius.Susan@epa.gov">Julius.Susan@epa.gov</a>

**PERIOD OF PERFORMANCE:** October 16, 2012 through September 29, 2013

**EPA GLOBAL CHANGE RESEARCH PROGRAM**

The EPA Office of Research and Development's Global Change Impacts and Adaptation (GCIA) staff within the Air, Climate and Energy (ACE) National Program assesses the potential vulnerability<sup>1</sup> to climate change (and other global change stressors such as land-use change) of EPA's ecosystem, water, human health and air protection efforts at the federal, regional, state, municipal, and tribal levels, as well as adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science to provide adaptation<sup>2</sup> support for decision makers and managers. Vulnerability and adaptation assessment activities in the GCIA aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA), and are designed to build the capacity of EPA program and regional offices, water and wetland managers, and other decision-makers to assess and respond to global change impacts on aquatic ecosystem processes and services.

**BACKGROUND**

The GCIA has worked with EPA's Office of Water, the Regions and states to assess the impact of climate change on bioassessment programs. This work has involved determining the sensitivity of bioindicators to climate change<sup>3</sup> and working more extensively with four states to examine

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<sup>1</sup> Vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It is a function of the sensitivity of a particular system to climate changes, its exposure to those changes, and its capacity to adapt to those changes.

<sup>2</sup> Adaptation refers to adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities.

<sup>3</sup> U.S. EPA. Climate Change Effects on Stream and River Biological Indicators: A Preliminary Analysis (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-07/085F, 2008.



historical trends in benthic macroinvertebrate data ([http://www.epa.gov/ncea/global/regional\\_shops.htm](http://www.epa.gov/ncea/global/regional_shops.htm)). These efforts led to a more recent project with the New England states, New York, and EPA Region 1 to create the analytical foundation for a climate change monitoring network capable of detecting impacts in streams. Workshops, webinars, and other presentations have led to subsequent interest by other regions and programs to conduct similar vulnerability assessments that support the development of monitoring networks to detect climate change-related effects in rivers and streams.

## **PURPOSE OF THIS WORK ASSIGNMENT**

The purpose of this PWS is to provide support to EPA to conduct vulnerability assessments that serve as the analytical foundation of monitoring networks capable of detecting climate change-related effects in rivers and streams nationally and regionally. Specifically, deliverables from this task order will inform a national framework and support efforts in Regions 3 and 4. This task order will also continue to advance analytical work on the types of benthic macroinvertebrate indicators that may respond most specifically to changes in the aquatic ecosystem due to climate change, through investigations of species traits.

## **DESCRIPTION OF TASKS**

### **TASK 1: Establish Communication and Develop a QAPP**

#### **SubTask 1.1. Establish Communication with the WAM and Develop a Regular Reporting Schedule**

The Contractor shall contact the WA COR and schedule a kickoff project meeting. In collaboration with the WA COR, the Contractor shall also establish a schedule for regular progress reports (e.g. one phone call per month for one hour), project meetings, and other communications throughout the period of performance of this Performance Work Statement (PWS).

*Task 1.1 Deliverable 1.1.A:* Brief, written progress reports as email to the WA COR. Due monthly or upon request by the WAM for the duration of this PWS.

*Task 1.1 Deliverable 1.1.B:* Project meetings and other communications, such as conference calls, as needed. Due upon request by the WA COR for the duration of this PWS.

#### **SubTask 1.2. Develop a QAPP**

All work conducted under this PWS shall be performed pursuant to an EPA-approved Quality Assurance Project Plan (QAPP). The contractor shall develop a single Quality Assurance Project Plan within 30 days after Task Order award for review and approval by the WA COR and the EPA QA Officer. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this PWS relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this PWS relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this PWS.

All electronic deliverables (i.e., computer files) shall be submitted in a format acceptable to EPA.

The contractor shall not incur billable costs for QA related work until receiving IN WRITING from the EPA WA COR that EPA has approved the QAPP.

Task 1.2 Deliverable 1.2.A: A draft QAPP submitted to the WA COR for review due two (2) weeks after Task Order award.

Task 1.2 Deliverable 1.2.B: A revised QAPP addressing WA COR's and QA officer's comments on the QAPP due one (1) week after receiving comments.

**TASK 2:        Theoretical framework for national vulnerability assessment of rivers and streams to support monitoring**

A theoretical framework is needed to describe the type of information necessary for conducting a climate change vulnerability assessment. The framework shall attempt to answer several questions:

- What types of climate change-related vulnerabilities are important for rivers and streams (e.g., changes in low flows/warmer temperatures, timing of winter/spring runoff, peak flows, etc.)?
- What are the ideal data that describe exposure, sensitivity, and adaptive capacity related to each of the vulnerabilities identified (including for present conditions and future conditions, and spatial and temporal resolution)?
- How is a national framework different from a regional approach (e.g., in terms of stream classifications using ecoregions or other available classification schemes, spatial and temporal resolution of sampling, etc.)
- What data are available for a national vs. regional approach?
- Once vulnerability strata are created, how can data from other monitoring efforts be incorporated into analyses to detect climate change-related trends in rivers and streams (using both biological and chemical data)?

This task shall create such a framework, describe and collect available data, and describe the statistical approach to analyze data collected in national and regional efforts through a dedicated monitoring network and including other relevant data (e.g., from National Aquatic Resource Surveys, US Forest Service freshwater monitoring, STREON, etc.).

**SubTask 2.1.    Describe vulnerabilities, data, and approaches**

Describe relevant vulnerabilities for rivers and streams nationally, data needed to describe such vulnerabilities, and national vs. regional approaches needed to identify these vulnerabilities using available literature, databases, and past GCIA projects. Some potential data sources and vulnerability approaches may be found in Vorosmarty et al., 2010 and USEPA, 2011.

Task 2.1 Deliverable 2.1.A: Draft memo describing vulnerabilities, data, and approaches due 6 weeks WA initiation.

Task 2.1 Deliverable 2.1.B: Conference call to discuss comments by WAM on Deliverable 2.1.A due within 1 week of receiving comments.

Task 2.1 Deliverable 2.1.C: Final memo due 2 weeks after Deliverable 2.1.B.

**SubTask 2.2. Identify Data Sources**

Identify available data sources and describe any tradeoffs associated with using data different from the ideal case.

Task 2.2 Deliverable 2.2.A: List of data sources, availability, and tradeoffs due 2 weeks after Deliverable 2.1.A.

**SubTask 2.3. Develop Analysis Plan**

Develop an analysis plan and describe the statistical approaches for national and regional monitoring efforts, as well as incorporation of data from other monitoring efforts. Present analysis plan to relevant EPA experts and stakeholders, e.g., ORD EMAP, OW/OWOW, potentially Regions, through a conference call or webinar.

Task 2.3 Deliverable 2.3.A: Draft analysis plan incorporating Deliverables 2.1.C and 2.2.A due 4 weeks after Deliverable 2.1.C.

Task 2.3 Deliverable 2.3.B: Presentation to relevant EPA experts and stakeholders to gather input and feedback on analysis plan due 3 weeks after receiving comments from WAM on Deliverable 2.3.A.

Task 2.3 Deliverable 2.3.C: Final analysis plan incorporating feedback from Deliverable 2.3.B due 2 weeks after presentation.

**TASK 3: Analytical support for regional networks in EPA Regions 3 and 4**

EPA Regions 3 and 4 are interested in developing climate change monitoring networks for their rivers and streams, similar to an effort conducted with EPA Region 1 states and New York.

**SubTask 3.1. Setup Regional Steering Committees**

Set up regional steering committees (RSC) for each region to develop and review monitoring network goals, approaches, analytical methods, and maps of vulnerability classes and potential monitoring sites. WAM will send invitations to selected RSC members.

Task 3.1 Deliverable 3.1: Proposed list of regional steering committee members for each Region due 2 weeks after WA initiation.

**SubTask 3.2. Coordinate Calls and Webinars**

The Contractor shall coordinate calls and webinars with regional steering committees to discuss methods and products.

Task 3.2 Deliverable 3.2.A: Conduct initial RSC call for each Region to provide project overview (Region 3) and to get a status update (Region 4) due 3 weeks after completing Deliverable 3.1. This call or a subsequent call will provide input to the project in terms of the specific direction for the analysis approaches for each Region.

Task 3.2 Deliverable 3.2.B: Conduct up to 5 additional webinars with each RSC to get input on analysis approach, data analysis, vulnerability maps, site selections, and present final results over the course of the WA.

### **SubTask 3.3.    Develop Regional Analysis Approaches**

Develop analysis approaches for both Region 3 and Region 4 based on RSC input. Region 3 is likely to want a paired approach using reference sites that are and are not impacted by acid deposition. Region 4 states will review their reference sites by ecoregion and are likely to want an approach that encompasses sampling sites beyond the highest condition (Biological Condition Gradient – BCG – level 1), either BCG 2 or 3. This approach may allow for descriptions of adaptive capacity at the lower BCG levels that provide restoration options that can improve overall condition and increase resilience/resistance to climate change impacts.

Task 3.3 Deliverable 3.3.A: Draft analysis approach for each Region due 6 weeks after RSC input (Deliverable 3.2.A).

Task 3.3 Deliverable 3.3.B: Final analysis approach revised after RSC input (one of Deliverable 3.2.B webinars) due 2 weeks after webinar.

### **SubTask 3.4.    Analyze Regional Data**

Analyze available regional data according to analysis plan to conduct vulnerability assessment and produce maps of vulnerability strata and potential sampling locations. Maps for Region 3 are likely to include a combination of new and pre-selected long-term sites, while maps for Region 4 are likely to include pre-selected sites by states.

Task 3.4 Deliverable 3.4.A: Draft analyses and vulnerability assessment results, along with draft maps due 12 weeks after approval of Deliverable 3.3.B.

Task 3.4 Deliverable 3.4.B: Presentations of draft analytical results, vulnerability assessments and maps to respective RSC due within 2 weeks after receiving comments on Deliverable 3.4.A from WAM.

Task 3.4 Deliverable 3.4.C: Final analyses and vulnerability assessments, along with maps due 4 weeks after Deliverable 3.4.B.

### **SubTask 3.5.    Finalize Monitoring Plan**

The Contractor shall compile the monitoring protocols and summarize guidelines for states on sampling procedures. This brief document shall include agreed upon site selection, equipment,

measurements, sampling, laboratory analyses, and any other relevant information for states to implement the monitoring plan.

*Task 3.5 Deliverable 3.5.A:* Draft monitoring plans due 3 weeks after Deliverable 3.4.C.

*Task 3.5 Deliverable 3.5.B:* Presentation of draft plan to respective RSC, either as conference call or webinar due 2 weeks after WAM approval of Deliverable 3.5.A.

*Task 3.5 Deliverable 3.5.C:* Final monitoring plans incorporating RSC and WAM comments due 2 weeks after Deliverable 3.5.B.

#### **SubTask 3.6.    Provide Data Files**

The Contractor shall provide to the WAM all modeling output generated in this Task Order as digital computer files. The data shall be provided in a digital format specified by the WAM on an external hard drive with sufficient storage memory for storing all necessary files. The Contractor shall organize model output files in a directory and using a file-naming convention agreed upon by the WAM.

*Task 3.6 Deliverable 3.6.:* Transmit all modeling output data as digital computer files in a file directory and using a file-naming convention specified by the WAM. Due three (3) weeks after approval of Deliverable 3.4.C.

#### **TASK 4:            Combine temperature and hydrologic-preference traits for Northeast by vulnerability category**

Temperature and hydrologic-preference modeling has been conducted using benthic macroinvertebrate data from New York and New England states. However, these datasets have not been combined to examine which taxa may respond to specific vulnerability categories, such as low flows with warm water temperatures. This task shall build on recent research to develop more specific climate change indicators for previously identified vulnerability categories in this region. Methods and analytical approaches shall be developed with expert input. The Contractor shall propose experts who will then be contacted to participate in the project. Their participation will entail reviewing proposed methods and analyses for developing these novel, combined trait-based indicators through conference calls, webinars, or written materials.

##### **Subtask 4.1.    Assemble expert steering committee**

The Contractor shall propose a list of experts who are conducting research into climate change-related traits, particularly in freshwater ecosystems. The WAM will contact selected experts to be part of the expert steering committee (ESC). The Contractor shall schedule conference calls and webinars as part of this task. Call topics are likely to include: (1) expert introductions and recent research; (2) data analysis done in Northeast using state and EPA datasets; (3) draft analysis plan for combining temperature and hydrologic traits; (4) presentation of results and comparison to other recent research; and (5) discussion of publication.

Task 4.1 Deliverable 4.1.A: List of experts with short description of relevant research and publications due 8 weeks after WA approval.

Task 4.1 Deliverable 4.1.B: Schedule and conduct initial conference call and subsequent webinars or calls according to availability of WAM and ESC members and deliverables to be presented 2 weeks after member confirmation.

**Subtask 4.2.**     Develop analysis plan

The Contractor shall review recent literature on species traits analyses, particularly related to climate change impacts detection, and documents suggested by the ESC. The Contractor shall then develop an analysis plan for the stream biological data in the Northeast, based upon this review.

Task 4.2 Deliverable 4.2.A: Draft analysis plan based on literature review and expert input from Deliverable 4.1.B due 8 weeks after Deliverable 4.1.B.

Task 4.2 Deliverable 4.2.B: Final analysis plan revised based on input from WAM and ESC 2 weeks after call/webinar with ESC (Deliverable 4.1.B) discussing the draft analysis plan (Deliverable 4.2.A).

**Subtask 4.3.**     Conduct analysis

The Contractor shall implement the analysis plan delivered in Subtask 4.2. Results shall also be presented to the ESC as part of Deliverable 4.1.B.

Task 4.3 Deliverable 4.3.A: Draft results based on analysis plan in Deliverable 4.2.B due 10 weeks after approval of Deliverable 4.2.B.

Task 4.3 Deliverable 4.3.B: Final results revised based on input from WAM and ESC 6 weeks after call/webinar with ESC (Deliverable 4.1.B) discussing the draft results (Deliverable 4.3.A).

**Subtask 4.4.**     Input Data into Freshwater Species Traits Database

The Contractor shall prepare all relevant data files to be uploaded into the online Freshwater Species Traits Database ([www.epa.gov/ncea/global/traits](http://www.epa.gov/ncea/global/traits)).

Task 4.4 Deliverable 4.4.: Upload relevant data files into online Freshwater Species Traits Database due 2 weeks after Deliverable 4.3.B.

**Task 5:**             **EPA Report on Vulnerability Assessment Methodologies and Monitoring**

The Contractor shall develop an EPA report documenting three regional (Northeast, EPA Regions 3 and 4) vulnerability assessments and the approach for a national vulnerability assessment to support river and stream monitoring of climate change-related effects.

**Subtask 5.1.     Prepare EPA report.**

The Contractor shall prepare an EPA report according to NCEA report guidelines (provided by WAM).

*Task 5.1 Deliverable 5.1.A:* Report outline due 2 weeks after Deliverable 3.4.C.

*Task 5.1 Deliverable 5.1.B:* Draft internal review draft of report due 4 weeks after approval of Deliverable 5.1.A.

*Task 5.1 Deliverable 5.1.C:* Internal review draft of report due 2 weeks after WAM comments on Deliverable 5.1.B.

**Task 6:             Journal Articles**

The Contractor shall assist with revisions to two previously developed manuscripts and develop outlines for three additional manuscripts that describe the results from the analytical work above. The Contractor shall assist with responding to internal and external review comments on the analytical framework for a Northeastern monitoring network manuscript and shall assist with finalizing a draft manuscript on vulnerability assessment in the Northeast for internal review. The three outlines will likely cover (1) the theoretical framework for streams and examples for how to include data from other networks using the vulnerability strata; (2) comparing the regional networks developed, along with indicator approaches for specific vulnerability categories; and (3) describing analyses and results of the combined trait-based indicators using data from the Northeast.

**SubTask 6.1.     Assist with revisions of two manuscripts**

The Contractor shall assist with responding to internal and external review comments on the manuscript of the Northeastern analytical framework for monitoring. The Contractor shall also assist with finalizing the draft manuscript on vulnerability assessment in the Northeast to submit to internal EPA review and responding to internal review comments.

*Task 6.1 Deliverable 6.1.A:* Revised analytical framework manuscript based on addressing internal review comments due 4 weeks after receipt of comments from WAM, such that manuscript can be submitted for EPA clearance and to journal.

*Task 6.1 Deliverable 6.1.B:* Call to discuss addressing external review comments 1 week after receipt of comments.

*Task 6.1 Deliverable 6.1.C:* Revised analytical framework manuscript as final submission to journal due 6 weeks after Deliverable 6.1.B.

*Task 6.1 Deliverable 6.1.D:* Draft vulnerability assessment manuscript in suitable journal format for internal review due 6 weeks after WA approval.

*Task 6.1 Deliverable 6.1.E:* Call to discuss addressing internal review comments 1 week after receipt of comments

Task 6.1 Deliverable 6.1F: Revised vulnerability assessment manuscript for EPA clearance and initial journal submission due 4 weeks after Deliverable 6.1E.

**SubTask 6.2.** Prepare outlines on three manuscript topics

The Contractor shall prepare three outlines on (1) the theoretical framework for streams and examples for how to include data from other networks using the vulnerability strata; (2) comparing the regional networks developed, along with indicator approaches for specific vulnerability categories; and (3) describing analyses and results of the combined trait-based indicators using data from the Northeast. These topics are tentative and shall be finalized with the WAM. Outlines shall be consistent with guidelines of target journals for each article.

Task 6.2 Deliverable 6.2.A: A proposed outline for a manuscript describing the theoretical framework for streams and examples for how to include data from other monitoring networks using the vulnerability strata due 2 weeks after approval of Deliverable 2.3.C.

Task 6.2 Deliverable 6.2.B: Final revised outline 1 week after receipt of WAM comments on Deliverable 6.1.A.

Task 6.2 Deliverable 6.2.C: A proposed outline for a manuscript comparing the regional networks developed, along with indicator approaches for specific vulnerability categories due 2 weeks after approval of Deliverable 3.5.B.

Task 6.2 Deliverable 6.2.D: Final revised outline 1 week after receipt of WAM comments on Deliverable 6.1.C.

Task 6.1 Deliverable 6.2.E: A proposed outline for a manuscript describing analyses and results of the combined trait-based indicators using data from the Northeast due 2 weeks after approval of Deliverable 4.3.B.

Task 6.2 Deliverable 6.2.F: Final revised outline 1 week after receipt of WAM comments on Deliverable 6.2.E.

**SCHEDULE OF BENCHMARKS & DELIVERABLES:**

Task No.	SubTask No.	DELIVERABLE	Incremental Schedule
1	1.1	1.1.A. Brief, written progress reports.	Due monthly or upon request by the WAM for the duration of this Task Order.



<b>1</b>	<b>1.1</b>	<b>1.1.B.</b> Project meetings and other communications, such as conference calls, as needed.	Due upon request by the WAM for the duration of this Task Order.
<b>1</b>	<b>1.2</b>	<b>1.2.A.</b> A draft QAPP	Due 2 weeks after Task Order award.
<b>1</b>	<b>1.2</b>	<b>1.2.B.</b> A revised QAPP	Due 1 week after WAM comments
<b>2</b>	<b>2.1</b>	<b>2.1.A.</b> Draft memo describing vulnerabilities, data, approaches	Due 6 weeks after WA award
<b>2</b>	<b>2.1</b>	<b>2.1.B.</b> Call on Deliverable 2.1.A comments	Due 1 week after receiving comments from WAM.
<b>2</b>	<b>2.1</b>	<b>2.1.C.</b> Final memo	Due 2 weeks after Deliverable 2.1.B.
<b>2</b>	<b>2.2</b>	<b>2.2.A.</b> List of data sources, availability, tradeoffs	Due 2 weeks after approval of Deliverable 2.1.A.
<b>2</b>	<b>2.3</b>	<b>2.3.A.</b> Draft analysis plan	Due 4 weeks after approval of Deliverable 2.1.C.
<b>2</b>	<b>2.3</b>	<b>2.3.B.</b> Presentation to experts and stakeholders	Due 3 weeks after WAM comments on Deliverable 2.3.A.
<b>2</b>	<b>2.3</b>	<b>2.3.C.</b> Final analysis plan	Due 2 weeks after Deliverable 2.3.B.
<b>3</b>	<b>3.1</b>	<b>3.1.</b> Proposed regional steering committee members.	Due 2 weeks after WA award.
<b>3</b>	<b>3.2</b>	<b>3.2.A.</b> Initial RSC call for each Region	Due 3 weeks after the approval of Deliverable 3.1.
<b>3</b>	<b>3.2</b>	<b>3.2.B.</b> Up to 5 additional webinars with each RSC	Scheduled during Task 3
<b>3</b>	<b>3.3</b>	<b>3.3.A.</b> Draft analysis approach for each Region	Due 6 weeks after Deliverable 3.2.A.
<b>3</b>	<b>3.3</b>	<b>3.3.B.</b> Final analysis approach	Due 2 weeks after respective RSC webinar.
<b>3</b>	<b>3.4</b>	<b>3.4.A.</b> Draft analyses, vulnerability assessment results, and maps	Due 12 weeks after approval of Deliverable 3.3.B.
<b>3</b>	<b>3.4</b>	<b>3.4.B.</b> Presentation of Deliverable 3.4.A to respective RSC	Due 2 after WAM comments on Deliverable 3.4.A.
<b>3</b>	<b>3.4</b>	<b>3.4.C.</b> Final analyses, vulnerability assessment results, and maps	Due 4 weeks after Deliverable 3.4.B.
<b>3</b>	<b>3.5</b>	<b>3.5.A.</b> Draft monitoring plans	Due 3 weeks after approval of Deliverable 3.4.C.
<b>3</b>	<b>3.5</b>	<b>3.5.B.</b> Presentation of Deliverable 3.5.A to respective RSC	Due 2 weeks after approval of Deliverable 3.5.A.
<b>3</b>	<b>3.5</b>	<b>3.5.C.</b> Final monitoring plans	Due 2 weeks after Deliverable 3.5.B.

3	3.6	3.6. Transmit output data	Due 3 weeks after Deliverable 3.4.C.
4	4.1	4.1.A. List of experts (ESC)	Due 8 weeks after WA approval
4	4.1	4.1.B. Initial conference call and subsequent webinar/call schedule with ESC	Due 2 weeks after Deliverable 4.1.A.
4	4.2	4.2.A. Draft analysis plan for traits data	Due 8 weeks after the approval of Deliverable 4.1.A.
4	4.2	4.2.B. Final analysis plan	Due 2 weeks after call/webinar with ESC
4	4.3	4.3.A. Draft results	Due 10 weeks after Deliverable 4.2.B.
4	4.3	4.3.B. Final results	Due 6 weeks after call/webinar with ESC
4	4.4	4.4. Upload data to Freshwater Species Traits Database	Due 2 weeks after Deliverable 4.3.B.
5	5.1	5.1.A. Report outline	Due 2 weeks after Deliverable 3.4.C.
5	5.1	5.1.B. Draft internal review draft report	Due 4 weeks after Deliverable 5.1.A.
5	5.1	5.1.C. Internal review draft	Due 2 weeks after approval of Deliverable 5.1.B.
6	6.1	6.1.A. Revised analytical framework manuscript	Due 4 weeks after receipt of internal review comments
6	6.1	6.1.B. Discuss external review comments	Due 1 week after receipt of external review comments
6	6.1	6.1.C. Final analytical framework manuscript	Due 6 weeks after Deliverable 6.1.B.
6	6.1	6.1.D. Draft vulnerability assessment manuscript	Due 6 weeks WA approval
6	6.1	6.1.E. Discuss internal review comments	Due 1 week after receipt of internal review comments
6	6.1	6.1.F. Revised vulnerability assessment manuscript for EPA clearance and journal submission	Due 4 weeks after Deliverable 6.1.E.
6	6.2	6.2.A. Outline for national framework article	Due 2 weeks after the approval of Deliverable 2.3.C.
6	6.2	6.2.B. Final outline	Due 1 week after approval of Deliverable 6.2.A.
6	6.2	6.2.C. Outline for comparing regional approaches article	Due 2 weeks after approval of Deliverable 3.5.B.
6	6.2	6.2.D. Final outline	Due 1 week after approval of Deliverable 6.2.C
6	6.2	6.2.E. Outline for describing traits-based analyses	Due 2 weeks after approval of Deliverable 4.3.B
6	6.2	6.2.F. Final outline	Due 1 week after approval of Deliverable 6.2.E.

**REPORTING**

All documentation and reporting under this Task Order shall be in compliance with contract requirements. See contract clause F.2, F.3, and J.2 "List of Attachments, Number 2 - Reports of Work".

Additional requirements specific to this Task Order are as follows:

Electronic deliverables must be in an original file format that can be supported by EPA after the end of the Period of Performance of the Task Order. The standard office software at EPA is MS Office. The standard GIS software at EPA is ESRI ArcGIS.

**TRAVEL**

Travel is not required under this PWS.

**CONTRACTOR IDENTIFICATION**

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

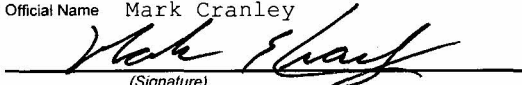
The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the WA COR.

**REFERENCES**

U.S. EPA. 2011. Implications of Climate Change for State Bioassessment Programs and Approaches to Account for Effects (External Review Draft). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-11/036A.

Voeroesmarty C. J.; McIntyre P. B.; Gessner M. O.; et al., 2010. Global threats to human water security and river biodiversity. *Nature* 467 (7315): 555-561.

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-01	
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number	
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name 0-01	
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2012 To 09/29/2013	
Comments:			
<input type="checkbox"/> Superfund      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund			
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.			
SFO (Max 2) <input type="checkbox"/>			
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)
			Budget Org/Code (Max 7)
			Program Element (Max 9)
			Object Class (Max 4)
			Amount (Dollars)
			(Cents)
			Site/Project (Max 8)
			Cost Org/Code (Max 7)
1			
2			
3			
4			
5			
Authorized Work Assignment Ceiling			
Contract Period: 09/30/2012 To 09/29/2013		Cost/Fee:      LOE:	
This Action:			
Total:			
Work Plan / Cost Estimate Approvals			
Contractor WP Dated: 10/31/2012		Cost/Fee: \$150,113.00      LOE: 1,300	
Cumulative Approved:		Cost/Fee: \$150,113.00      LOE: 1,300	
Work Assignment Manager Name Britta Bierwagen		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number 703-347-8613	
		FAX Number:	
Project Officer Name Sharon Boyde		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number: 703-347-8576	
		FAX Number: 703-374-8696	
Other Agency Official Name		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number:	
		FAX Number:	
Contracting Official Name Mark Cranley		Branch/Mail Code: CPOD	
_____ (Signature)		_____ (Date)	
		Phone Number: 513-487-2351	
		FAX Number: 513-487-2109	

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-02	
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number	
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Review and Simulation Modeling	
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 2e	
Comments: Please provide a Work Plan NLT 10/31/2012.		Period of Performance From 09/30/2012 To 09/29/2013	
<div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Superfund         <div style="text-align: center;">Accounting and Appropriations Data</div> <input checked="" type="checkbox"/> Non-Superfund       </div>			
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.			
SFO (Max 2) <input type="checkbox"/>			
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)
1			
2			
3			
4			
5			
Authorized Work Assignment Ceiling			
Contract Period: 09/30/2012 To 09/29/2013		Cost/Fee: LOE:	
This Action:			
Total:			
Work Plan / Cost Estimate Approvals			
Contractor WP Dated:		Cost/Fee: LOE:	
Cumulative Approved:		Cost/Fee: LOE:	
Work Assignment Manager Name Thomas Johnson		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number 703-347-8618	
		FAX Number:	
Project Officer Name Sharon Boyde		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number: 703-347-8576	
		FAX Number: 703-374-8696	
Other Agency Official Name		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number:	
		FAX Number:	
Contracting Official Name Mark Cranley		Branch/Mail Code: CP00	
(Signature)  (Date) 10/16/12		Phone Number: 513-487-2351	
		FAX Number: 513-487-2109	

**Performance Work Statement  
Tetra Tech, Inc.  
Contract EP-C-12-060  
Work Assignment 0-02**

**I. Title:** Literature Review and Simulation Modeling to Characterize the Vulnerability of U.S. Lakes and Reservoirs to Climate Change

**II. Period of Performance:** October 16, 2012 through September 29, 2013

**III. Work Assignment Manager:**

Thomas Johnson, Ph.D.  
U.S. Environmental Protection Agency  
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**Alternate WAM:**

Christopher Clark, Ph.D.  
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**IV. Introduction:**

The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. The potential effects of climate change on watershed hydrology, water quality, and freshwater aquatic systems are increasingly well documented. Climate change will have dramatic implications for lakes and reservoirs in terms of ecosystem health, ecosystem services, biodiversity, human health, and water supply. Increasing air temperature has been documented to increase surface water temperature and thermal stratification in the water column of lakes and reservoirs. This effect will lead to numerous cascading effects on water quality, aquatic habitat, and water supply. The impact of changing hydrology is less well understood but will likely contribute to changing loads of carbon and nutrients, shifting pH, and changes in habitat quality. Although these changes are likely to vary regionally, they will impact lake/reservoir water quality.

Although some studies have looked at observed impacts of climate change at specific sites (Sahoo *et al.* 2011) and on larger spatial scales through remote sensing (Schneider *et al.* 2010; Schneider *et al.* 2009), few studies have evaluated the potential vulnerability of U.S. lakes and reservoirs to climate change. Managing the risk of harmful future impacts will require an improved understanding of how future climate change in combination with landcover change will impact the hydrology, water quality, and ecology of U.S. lakes and reservoirs.

### **Related and Supporting GCRP Projects**

Simulation modeling in this project will use existing climate and land-use change scenarios provided by EPA. Final selection of scenarios will be determined in consultation with the COR. Potential sources of scenarios are described below.

The EPA GCRP has partnered with the North American Regional Climate Change Assessment Project (NARCCAP), which. NARCCAP provides detailed scenarios of regional climate change over the U.S. in a form suitable for driving basin-scale hydrologic models and for use in impacts assessments. More information about NARCCAP can be found at <http://www.narccap.ucar.edu/>. In addition to NARCCAP, other existing scenarios are available from four the Coupled Model Intercomparison Project Phase 3 (CMIP3) data (served at [http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/)). These scenarios are downscaled using bias-corrected and spatially downscaled (BCSD) techniques.

Land use scenarios are available from EPA's Integrated Climate and Land Use Scenarios (ICLUS) project. ICLUS has developed seamless, national-scale land use change scenarios compatible with the IPCC emissions storylines underlying NARCCAP and other GCM climate change projections. ICLUS provides decadal projections of changes in housing density and impervious cover throughout the contiguous U.S. through the year 2100.

### **V. Objectives:**

This Work Assignment is for conducting an assessment of the vulnerability of U.S. lakes and reservoirs to climate change. Key objectives of this effort are:

- (1) to review existing literature on observed, projected, and potential for climate change effects on lakes and reservoirs,
- (2) to conduct new, simplified simulation modeling to identify potential vulnerabilities of lakes and reservoirs to climate change, and
- (3) to identify potential available adaptation strategies for managing the impacts of climate change on lakes and reservoirs.

Completing the Tasks outlined in this Work Assignment will require

- 1) identification of the major variables controlling lake/reservoir response to climate change,
- 2) choosing a group of well studied and monitored systems to use as the basis for development of lake/reservoir 'archetypes' that represent these dynamics and
- 3) applying a simplified modeling approach to generalize responses within pre-selected lake/reservoir archetypes (examples of relevant models are enumerated below). Detailed place-based modeling will not be required. Rather, a simplified screening level approach will be applied to avoid the difficulty of

obtaining data records from many study sites and controlling for the many variables present at individual sites. We anticipate that it will be necessary to consider 20-50 lakes and reservoirs across the U.S. in order to adequately represent the variability in system type. Results of this effort will contribute to 2 written manuscripts that discuss the vulnerability of U.S. lakes/reservoirs to climate change, indicators of vulnerability for use by resource managers, and generalized modeling tools for predicting lake response to climate change based on key drivers.

## **VI. Specific Tasks and Deliverables:**

### **Task 1 – Prepare Workplan, Establish Communication, and Prepare QAPP**

#### **SubTask 1.1. Prepare Work Plan and Cost Estimate**

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

#### **SubTask 1.2. Establish communication with the COR and develop a regular reporting schedule**

The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

*Deliverable 1.2.A:* Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

*Deliverable 1.2.B:* Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

#### **SubTask 1.3. Develop a QAPP**

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a single Quality Assurance Project Plan within 30 days after project start for review and approval by the TOM and the EPA QA Officer. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment.

*Deliverable 1.3.A:* A draft QAPP submitted to the COR for review. Due 2 weeks after award.

*Deliverable 1.3.B:* A revised QAPP addressing COR comments on the draft submitted to the COR for approval. Due 1 week after approval of Deliverable 1.3.A.

### **Task 2 - Conduct Literature Review**



The contractor shall conduct a detailed and thorough review of the peer reviewed scientific literature addressing climate change effects of lakes and reservoirs and prepare a written manuscript describing results.

#### **SubTask 2.1. Conduct a literature review**

The contractor shall conduct a complete and thorough review of the peer reviewed scientific literature to addresses the following questions:

- (1) what are the observed, projected, and potential for climate change effects on the hydrology, water quality, and ecology of lake and reservoir systems,
- (2) what is known about the regional vulnerabilities of U.S. lakes and reservoirs to climate change, and
- (3) what are the available adaptation strategies for managing the impacts of climate change on lakes and reservoirs.

For the first question, the contractor should consider empirical and theoretical modeling of lake and watershed dynamics, including but not limited to surface water temperature, thermal stratification, nutrient cycling, oxygen dynamics, water supply, aquatic habitat, biodiversity and water quality. For the second question, vulnerability should be explicitly separated into the various contributing sets of factors, including but not limited to regional climate, basin characteristics, lake properties (physical and biological), inlet/outlet, and human management of the lake and surrounding basin. For the third question, the contractor should consider the range of available adaptation strategies, including but not limited to managing point and non-point source pollution, artificial mixing, and adaptive management frameworks. The contractor shall prepare a draft manuscript discussing the questions listed above based on and citing all relevant literature and submit to the COR for comment and approval. The manuscript shall be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. After receiving COR comments on the draft, the contractor shall address all COR comments to prepare a final draft manuscript and submit to the COR for approval. The contractor shall provide pdf versions of all relevant literature to the COR.

*Deliverable 2.1.A:* A draft manuscript discussing the literature on the 3 questions enumerated above. Due to the COR 8 weeks months after award.

*Deliverable 2.1.B:* A final manuscript discussing the literature on the 3 questions enumerated above and addressing COR comments on Deliverable 2.1.A. Due 2 weeks after receiving COR comments on Deliverable 2.1.A.

#### **Task 3 - Simulation Modeling to Assess Lake and Reservoir Vulnerability to Climate Change**

The Contractor shall conduct simulation modeling to assess the vulnerability of U.S. lakes and reservoirs to climate change using a 1D hydrodynamic model such as DYRESM (University of Western Australia – CWR) or LCM (University of California, Davis – TERC). Models will be applied to a group of hypothetical lakes designed to represent the range of lake ‘archetypes’ occurring naturally and created as reservoirs for water resource development. Using regional climate data, models will be used to investigate potential changes in the thermal structure of the hypothetical lakes under various plausible climate change scenarios to identify indicators of lake/reservoir vulnerability to climate change. It is estimated that approximately 10 climate scenarios will be needed in conjunction with approximately 10

lake/reservoir archetypes, resulting in 100 model simulations. The exact numbers of scenarios, archetypes and simulations will be determined in consultation with the COR and will take into account feasibility and level of effort for run multiple simulations.

### **SubTask 3.1.** Designation of Lake Archetypes

Using the results of Subtask 2.1, the contractor shall develop a recommended set of criteria for designating lake archetypes, as well as a recommendation of lake archetypes to include in the analyses.

*Deliverable 3.1.A:* A memo describing proposed lake archetypes submitted to the COR for approval. Due 12 weeks after award.

### **SubTask 3.2.** Develop an analysis plan for simulation modeling to address study goals

The contractor shall, in consultation with the COR, develop a proposed analysis plan for simulation modeling to address study goals. The contractor shall prepare a Design Memo that specifies the model used, lake-types to be modeled, input data sources, climate types and climate scenarios that will be simulated and submit to the COR for approval.

*Deliverable 3.2.A:* A memo describing the proposed analysis plan submitted to the COR for approval. Due 2 weeks after approval of Deliverable 3.1.A.

### **Subtask 3.3.** Conduct model simulations and data analysis

The Contractor shall acquire all necessary input data, setup, and run model simulations described in the design memo in Deliverable 3.2.A. The Contractor shall also prepare summary statistics and conduct other data analysis to characterize the relative vulnerability of the various lake types to climate change and develop indicators of key vulnerabilities.

*Deliverable 3.3.A.* Results of simulation modeling in MS Excel format. Due 8 weeks after approval of Deliverable 3.2.A.

## **Task 4. Prepare Written Manuscripts for Publication**

**SubTask 4.1.** Prepare a written manuscript presenting and discussing simulation results describing regional vulnerability of US. Lakes and reservoirs to climate change

The Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages including figures/tables) presenting and discussing simulation results describing regional vulnerability of US. Lakes and reservoirs to climate change. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. Information from the literature review in Task 2 can be adapted as introduction and other sections of the manuscript as appropriate. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

*Deliverable 4.1.A.* A proposed outline for manuscript discussing regional vulnerability to climate change based on simulation results. Due 2 weeks after approval of Deliverable 3.3.A.

*Deliverable 4.1.B:* A first draft manuscript discussing regional vulnerability to climate change based on simulation results submitted to the COR for review. Due 6 weeks after approval of Deliverable 3.3.A.

*Deliverable 4.1.C:* A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 4.1.B.

**SubTask 4.2.** Prepare a written manuscript presenting and discussing management approaches available to address climate change impacts on lakes and reservoirs.

The Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages including figures/tables) presenting and discussing management approaches available to address climate change impacts on lakes and reservoirs. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. Information from the literature review in Task 2 can be adapted as introduction and other sections of the manuscript as appropriate. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

*Deliverable 4.2.A.* A proposed outline for manuscript discussing management approaches available to address climate change impacts on lakes and reservoirs. Due 6 weeks after approval of Deliverable 3.3.A.

*Deliverable 4.2.B:* A first draft manuscript discussing management approaches available to address climate change impacts on lakes and reservoirs submitted to the COR for review and approval. Due 10 weeks after approval of Deliverable 3.3.A.

*Deliverable 4.2.C:* A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 4.2.B.

## **VII. Schedule of Milestones and Deliverables:**

Task No.	DELIVERABLE	Schedule
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR
1	1.3.A. Draft QAPP	Due 2 weeks after award
1.	1.3.B. Final QAPP	Due 1 week after Deliverable 1.3.A
2	2.1.A. Draft literature reviews.	Due 8 weeks after award
2	2.1.B. Final literature review	Due 2 weeks after the Deliverable 2.1.A

3	3.1.A. Lake archetype memo	Due 12 weeks after award
3	3.2.A. Proposed analysis plan	Due 2 weeks after Deliverable 3.1.A
3	3.3.A. Simulation results	Due 8 weeks after Deliverable 3.2.A
4	4.1.A. Outline - Vulnerability manuscript	Due 2 weeks after Deliverable 3.3.A
4	4.1.B. Draft - Vulnerability manuscript	Due 6 weeks after Deliverable 3.3.A
4	4.1.C. Final - Vulnerability manuscript	Due July 12, 2013
4	4.2.A. Outline – Mgmt approaches manuscript	Due 6 weeks after Deliverable 3.3.A
4	4.2.B. Draft - Mgmt approaches manuscript	Due 10 weeks after Deliverable 3.3.A
4	4.2.C. Final - Mgmt approaches manuscript	Due August 9, 2013

#### **VIII. Acceptance Criteria:**

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

#### **IX. Conflict of Interest:**

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

#### **X. Management Controls:**

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on subsequent deliverables.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

#### **XI. Notice Regarding Guidance Provided Under This Work Assignment:**

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

#### **XII. References:**

Sahoo, G. B., S. G. Schladow, J. E. Reuter, and R. Coats. 2011. Effects of climate change on thermal properties of lakes and reservoirs, and possible implications. *Stochastic Environmental Research and Risk Assessment* **25**: 445-456.

Schneider, P., and S. J. Hook. 2010. Space observations of inland water bodies show rapid surface warming since 1985. *Geophysical Research Letters* **37**.

Schneider, P. and others 2009. Satellite observations indicate rapid warming trend for lakes in California and Nevada. *Geophysical Research Letters* **36**.

Work Assignment Form. (WebForms v1.0)

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-03 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period   09/30/2012   To   09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Causal Assessment Team Support								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From   09/30/2012   To   09/29/2013								
Comments: Please provide a WP NLT 11/05/2012										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012   To   09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:				LOE:		
Cumulative Approved:				Cost/Fee:				LOE:		
Work Assignment Manager Name   Kate Schofield							Branch/Mail Code:			
_____ (Signature)							_____ (Date)			
Project Officer Name   Sharon Boyde							Phone Number   703-347-8533			
_____ (Signature)							_____ (Date)			
Other Agency Official Name							FAX Number:			
_____ (Signature)							_____ (Date)			
Contracting Official Name   Mark Cranley							Branch/Mail Code:			
_____ (Signature)							_____ (Date)			
							Phone Number:   703-374-8696			
							Branch/Mail Code:   CPOD			
							Phone Number:   513-487-2351			
							FAX Number:   513-487-2109			



**TETRA TECH  
EP-C-12-060  
WORK ASSIGNMENT NUMBER 0-03**

**TITLE:** Causal Assessment Team Support

**WORK ASSIGNMENT  
MANAGER (WAM):**

**Kate Schofield**  
U.S. EPA (MC 8623P)  
1200 Pennsylvania Ave. NW  
Washington, DC 20460  
Phone #: 703-347-8533

**Physical and Overnight Delivery Address:**  
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Arlington, VA 22202

**ALTERNATE WA MANAGER:**

**Michael Griffith**  
U.S. EPA (MS A-110)  
26 W. Martin Luther King Dr.  
Cincinnati, OH 45268  
Phone #: 513-569-7034

**PROJECT OFFICER:**

**Sharon Boyde**  
U.S. EPA (MC 8601P)  
1200 Pennsylvania Ave. NW  
Washington, DC 20460  
Phone #: 703-347-8576

**PERIOD OF PERFORMANCE:** October 26, 2012 to September 29, 2013

**ESTIMATED LEVEL OF EFFORT:** 230 labor hours

**INTRODUCTION & BACKGROUND**

The contractor shall carry out tasks related to ongoing Information Technology (IT) and related support for U.S. EPA's Causal Assessment Team (CAT) and CAT's website, the Causal Analysis/Diagnosis Decision Information System (CADDIS). CADDIS reflects the work of CAT, providing ecological assessment resources for natural resource managers and academics in the context of cause-effect relationships.

The tasks described herein represent activities of low to high technical complexity involving basic maintenance of the CADDIS website, addition of new material to the website, and continued development of the website's literature-based evidence tools.

## **OBJECTIVES**

The objectives of this work assignment (WA) are to assist EPA's CAT with:

- Continued maintenance of the CADDIS website, including trouble-shooting any operational issues associated with the current website;
- Development and addition of new content to the CADDIS website; and
- Continued development of the CADDIS ecological evidence database and its associated user interfaces (the Interactive Conceptual Diagram (ICD) application and the CADDIS Literature Resource (CADLit)) and collaborative platforms.

## **MEETINGS**

Throughout the WA performance period, the contractor shall schedule meetings (including conference calls and in-person meetings with the Work Assignment Contract Officer Representative (WA-COR) and Alternate WA-COR, as appropriate. For all meetings, the contractor shall prepare and e-mail meeting notes and action items to the WAM within two business days, in text format within e-mail. Meetings shall be planned for and incorporated within the following tasks as appropriate.

### **TASK 1: Prepare work plan, cost estimate, Quality Assurance Project Plan & monthly reports**

The contractor shall prepare and submit a work plan and a cost estimate in response to this WA. This effort will require familiarity with CADDIS and CAT projects; expertise in ecology, information technology, Apex and Java programming, database management, and website design; and knowledge of the U.S. EPA Web Guidelines. The work plan shall include a schedule of deliverables and all interim deliverables.

The contractor shall prepare a Quality Assurance Project Plan (QAPP) in response to this work assignment. The QAPP shall be written in accordance with U.S. EPA QA standards, and provided to the WAM in electronic form, when the WP and cost estimate are submitted.

The contractor shall prepare and submit monthly reports detailing progress on WA tasks.

## **TASK 2: Maintenance of and additions to the CADDIS website**

### **Sub-task 2.1 – Trouble-shoot IT issues associated with the current CADDIS website**

The contractor shall continue to make sure all components of the current CADDIS website are operational on EPA production servers, and shall address any IT-associated complications that arise.

### **Sub-task 2.2 – Develop new content for the CADDIS website**

The contractor shall assist in developing new material for the CADDIS website. This material may include (but not be limited to):

- New source and stressor modules;
- Revised and new pages on analytical methods; and
- Other modules relevant to causal assessment.

Assistance from the contractor may include (but not be limited to):

- Making new content web-compliant (e.g., by converting to HTML using up-to-date EPA web standards and templates, by making material Section 508 compliant);
- Obtaining appropriate copyrights for materials used in new content; and
- Revising of draft content, based on external review comments.
- Revising of existing CADDIS website pages, to reflect incorporation of new content

Development of new content shall be conducted per technical directives, issued via e-mail from the WA-COR/Alternate WA-COR. Webpages shall be provided to the WA-COR/Alternate WA-COR as html pages.

## **TASK 3: Finalize development of literature-based evidence tools on CADDIS**

### **Sub-task 3.1 – Complete revisions to literature-based evidence tools (ICD & CADLit)**

The contractor shall complete revisions to the ICD application and CADLit (as identified under WA 4-5) on their development servers, per technical directives issued via e-mail from the WA-COR/Alternate WA-COR. These revisions may include, but not be limited to:

- Completion of Oracle Apex forms for CADLit;
- Revision of ICD application data, to merge organism and response fields within the database;
- Quality assurance for migration of data to new data table structures; and
- Quality assurance for exchange of information using EPA/eWater web service.

### **Sub-task 3.2 – Deploy revised literature based evidence tools to EPA production servers**

Once revisions to the literature-based evidence tools are complete, the contractor shall undertake activities necessary to deploy new versions of these applications to EPA production servers. These activities shall include, but not be limited to:

- Providing code to National Computer Center staff for posting to EPA staging servers;
- Addressing any issues arising from application scans on EPA staging servers; and
- Testing applications on EPA staging servers and addressing any issues that arise.

#### **TASK 4: Provide general technical support**

The contractor shall provide CAT with general technical support per written technical directives throughout the performance period. This support may include, but shall not be limited to, the creation of graphics and figures, organization and compilation of review comments, and other efforts.

#### **DELIVERABLE SCHEDULE**

<b>Task</b>	<b>Description (deliverables)</b>	<b>Due date (business days after WA initiation)</b>
1	<b>Prepare work plan, cost estimate &amp; QAPP</b>	20
1	<b>Prepare monthly reports</b>	monthly
2.1	<b>Trouble-shoot IT issues with 2010 release</b>	As needed
2.2	<b>Develop new content for the CADDIS website (html files to WAM)</b>	As needed
3.1	<b>Complete revisions to literature-based evidence tools</b>	200 days
3.2	<b>Deploy revised tools to EPA production servers</b>	260 days
4	<b>Provide general technical support</b>	As needed
	<b>Total Level of Effort Estimated for all Tasks</b>	<b>230 hrs</b>

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460		Work Assignment Number 0-03								
<b>Work Assignment</b>		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Title of Work Assignment/SF Site Name Causal Assessment Team Support								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW								
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2012 To 09/29/2013								
Comments:										
<input type="checkbox"/> Superfund		Accounting and Appropriations Data								
<input type="checkbox"/> SFO (Max 2)		<input checked="" type="checkbox"/> Non-Superfund								
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee: \$0.00		LOE:						
09/30/2012 To 09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 11/08/2012		Cost/Fee: \$26,159.00		LOE: 230						
Cumulative Approved:		Cost/Fee: \$26,159.00		LOE: 230						
Work Assignment Manager Name Kate Schofield						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
Project Officer Name Sharon Boyde						Phone Number 703-347-8533				
_____ (Signature)						_____ (Date)				
Other Agency Official Name						FAX Number:				
_____ (Signature)						_____ (Date)				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-04 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Workshop-Urban Vulnerability								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 21 Period of Performance From 09/30/2012 To 09/29/2013								
Comments: Work Plan to be submitted NLT 11/13/2012										
<input type="checkbox"/> Superfund    Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
SFO (Max 2) <input type="checkbox"/> Note: To report additional accounting and appropriations date use EPA Form 1900-69A.										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012 To 09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		Cost/Fee:		LOE:						
Cumulative Approved:		Cost/Fee:		LOE:						
Work Assignment Manager Name Christopher Clark						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number 703-347-8665				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

**TETRA TECH**  
**EP-C-12-060**  
**PERFORMANCE WORK STATEMENT**  
**WORK ASSIGNMENT 0-04**

**TITLE:** Workshop to coordinate research on urban vulnerability to climate change.

<b>Task Order Manager (WAM)</b> Name: Christopher Clark Office: ORD/NCEA/GCRP 1200 Pennsylvania Ave., NW (MC 8601P) Washington, DC 20460 Phone: 703-347-8665 Fax: 703-347-8694 Email: <a href="mailto:clark.christopher@epa.gov">clark.christopher@epa.gov</a>	<b>Alternate Task Order Manager (AWAM)</b> Name: Susan Julius Office: ORD/NCEA/GCRP 1200 Pennsylvania Ave., NW (MC 8601P) Washington, DC 20460 Phone: 703-347-8619 Fax: 703-347-8694 Email: <a href="mailto:julius.susan@epa.gov">julius.susan@epa.gov</a>
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**PERIOD OF PERFORMANCE:** October 26, 2012 through September 29, 2013

**EPA GLOBAL CHANGE RESEARCH PROGRAM**

The EPA Office of Research and Development's Global Change Impacts and Adaptation (GCIA) staff within the Air, Climate and Energy (ACE) National Program assesses the potential vulnerability<sup>1</sup> to climate change (and other global change stressors such as land-use change) of EPA's ecosystem, water, human health and air protection efforts at the federal, regional, state, municipal, and tribal levels, as well as adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science to provide adaptation<sup>2</sup> support for decision makers and managers. Vulnerability and adaptation assessment activities in the GCIA aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA), and are designed to build the capacity of EPA program and regional offices, water and wetland managers, and other decision-makers to assess and respond to global change impacts on aquatic ecosystem processes and services.

**BACKGROUND**

The GCIA, through coordination with NSF, DOE, and various U.S. academic and non-academic institutions, is developing a research program to assess the vulnerability of U.S. cities to climate change. A portion of this work is targeted to take place in five specific cities: Los Angeles CA, Portland WA, Raleigh-Durham NC, Tampa FL, and Boston MA. The initial focus of the research is on how climate change will affect water resources for these urban areas.

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<sup>1</sup> Vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It is a function of the sensitivity of a particular system to climate changes, its exposure to those changes, and its capacity to adapt to those changes.

<sup>2</sup> Adaptation refers to adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities.

## **PURPOSE OF THIS WORK ASSIGNMENT**

The purpose of this work assignment is to provide administrative and logistical support to EPA to conduct one workshop for the purpose of coordinating the development of research activities on the vulnerability of U.S. cities to climate change.

## **DESCRIPTION OF TASKS**

### **TASK 1:           Establish Communication**

#### **SubTask 1.1.   Establish Communication with the WAM and Develop a Regular Reporting Schedule**

The Contractor shall contact the WAM and schedule a kickoff project meeting. In collaboration with the WAM, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this work assignment.

Task 1.1 Deliverable 1.1.A: Brief, written progress reports as email to the WAM. Due monthly or upon request by the WAM for the duration of this Task Order.

Task 1.1 Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WAM for the duration of this work assignment.

### **TASK 2:           Workshop Logistics and Support Facilitation**

Workshop participants shall be identified from the ULTRA-Ex collaborators and other related groups in consultation with the WAM (20-25 participants). EPA has already identified 20-25 participants to attend a workshop to be held in D.C., Nov 1-2, 2012. Contractor shall facilitate logistical support for participants (including travel for participants), provide facilitation support for the EPA, which may include forming and leading breakout groups, organizing and coordinating presentations, facilitating discussion, and note taking. The primary goal of this workshop is to develop a coordinated research plan among the institutions from the five locations that meets the following objectives: (1) articulates a clear research question to address, (2) identifies EPA decision points germane to those research questions, (3) presents a methodology for answering the research question, and (4) assigns responsibilities to participants for post-workshop activities.

Task 2 Deliverable 2.A: Pre-workshop material, including a spreadsheet of workshop participants and logistical information, draft and final agenda, and other read-ahead material identified in consultation with the WAM. Due 4 days after approval of Deliverable 1.2.B.

Task 2 Deliverable 2.B: Digital files of workshop output (presentations, word document for notes, other as needed). Due 2 weeks after the workshop.



**Task 3: Post-Workshop Report**

In consultation with the WAM, the Contractor shall write a post-workshop report. The report will (1) summarize the presentations and discussions held at the workshop, and (2) synthesize this information in terms of the four objectives presented in Task 2.

Task 3 Deliverable 3.A: A draft workshop report. Due one month after the workshop.

Task 3 Deliverable 3.B: A final workshop report. Due one month after approval of Deliverable 3.A.

**SCHEDULE OF BENCHMARKS & DELIVERABLES:**

<b>Task No.</b>	<b>SubTask No.</b>	<b>DELIVERABLE</b>	<b>Incremental Schedule</b>
<b>1</b>	<b>1.1</b>	<b>1.1.A.</b> Brief, written progress reports.	Due monthly or upon request by the WAM for the duration of this Task Order.
	<b>1.1</b>	<b>1.1.B.</b> Project meetings and other communications, such as conference calls, as needed.	Due upon request by the WAM for the duration of this Task Order.
<b>2</b>	<b>NA</b>	<b>2.A.</b> A spreadsheet of workshop participants and logistical information.	Due 3 days after approval of Deliverable 1.2.B
	<b>NA</b>	<b>2.B.</b> Digital files of workshop output (presentations, word document for notes, other as needed).	Due 2 weeks after the workshop.
<b>3</b>	<b>NA</b>	<b>3.A.</b> A draft workshop report.	Due one month after the workshop
	<b>NA</b>	<b>3.B.</b> A final workshop report.	Due one month after approval of Deliverable 3.A.

**REPORTING**

All documentation and reporting under this work assignment shall be in compliance with contract requirements. See contract clause F.2, F.3, and J.2 "List of Attachments, Number 2 - Reports of Work".

**TRAVEL**

Travel is required under this work assignment. Contractor is expected to cover travel costs for workshop participants, including airfare, hotel costs, per diem, and other costs incurred for workshop participation.

**CONTRACTOR IDENTIFICATION**

Contractor personnel shall always identify themselves as Contractor employees by name and organization and physically display that information through an identification badge. Contractor personnel are prohibited from acting as the Agency's official representative.

The Contractor shall refer any questions relating to the interpretation of EPA policy, guidance, or regulation to the Work Assignment Manager.

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-04 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period   09/30/2012   To   09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Workshop to Coordinate research								
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From   09/30/2012   To   09/29/2013								
Comments:										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
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Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012   To   09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		11/06/2012		Cost/Fee:		\$43,024.00		LOE: 221		
Cumulative Approved:				Cost/Fee:		\$59,249.00		LOE: 221		
Work Assignment Manager Name   Christopher Clark							Branch/Mail Code:			
_____ (Signature)							_____ (Date)			
Project Officer Name   Sharon Boyde							Phone Number   703-347-8665			
_____ (Signature)							_____ (Date)			
Other Agency Official Name							FAX Number:			
_____ (Signature)							_____ (Date)			
Contracting Official Name   Mark Cranley							Branch/Mail Code:   CPOD			
_____ (Signature)							_____ (Date)			
							Phone Number:   513-487-2351			
							FAX Number:   513-487-2109			

**EPA**United States Environmental Protection Agency  
Washington, DC 20460**Work Assignment**

Work Assignment Number

0-05

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2013

Base ☒

Option Period Number

Title of Work Assignment/SF Site Name

Support for Conductivity Bench

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2012 To 09/01/2013

Comments:

Please provide a Work Plan by 01/02/2013.



Superfund

## Accounting and Appropriations Data



Non-Superfund

SFO  
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
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## Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2013

Cost/Fee:

LOE:

This Action:

Total:

## Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Susan Cormier

Branch/Mail Code:

Phone Number 513-569-7995

FAX Number:

(Signature)

(Date)

Project Officer Name Sharon Boyde

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

(Signature)

(Date)

Other Agency Official Name

Branch/Mail Code:

Phone Number:

FAX Number:

(Signature)

(Date)

Contracting Official Name Mark Cranley

Branch/Mail Code: CPOD

Phone Number: 513-487-2351

FAX Number: 513-487-2109

(Signature)

(Date) 12/18/12

**Performance Work Statement  
Tetra Tech, Inc.  
EP-C-12-060  
Work Assignment 0-05**

**TITLE: Support for Conductivity Benchmark Efforts**

**PERIOD OF PERFORMANCE:** CO Approval thru September 29, 2013

**WORK ASSIGNMENT MANAGER**

Susan Cormier, Ph.D.  
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National Center for Environmental Assessment  
26 W. M. L. King Drive  
Cincinnati, OH 45268  
513-569-7034 (voice)  
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**ALTERNATE**

Michael Griffith, Ph.D.  
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**INTRODUCTION**

The principal focus of this new work assignment 1-X is to provide analyses and documentation to support the development of a method and criterion for an ionic mixture measured as specific conductivity. The original method is described in “A Field Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams,” document number EPA/600/R 10/023F available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809>, heretofore, referred to as the *Conductivity Report*, and reports and manuscripts derived from the *Conductivity Report*. EPA will also provide the drafts of the two source white papers that will be used to inform the development of a water quality criterion for conductivity: *Development of Maximum Magnitude, and Duration and Frequency Parameters for Field based Conductivity Benchmark*, hereafter referred to as the *Magnitude, Duration, and Frequency Report* and *Regional Applicability of a*

*Field Based Aquatic Life Benchmark for Conductivity*, hereafter referred to as the *Applicability Report*.

The Conductivity Report adapts the standard U.S. EPA methodology for deriving ambient water quality criteria. Rather than use toxicity test results, the adaptation uses field data to determine the loss of 5% of genera from streams. The method is applied to derive effect benchmarks for dissolved salts as measured by specific conductivity in Appalachian streams using data from West Virginia. This benchmark is intended to protect the biological integrity of waters in the region. Field data were used because sufficient and appropriate laboratory data were not available and because high quality field data were available to relate specific conductivity to effects on biotic communities. Supplementary documentation is supplied in the form of 10 appendices: a general causal assessment for effects of ionic stress, analysis of potential confounding, figures of individual genera response to ionic stress, a validation of using an independent dataset from KY, and a landscape analysis of sources and increased levels of conductivity. In order for EPA to enable this work to be used in policy decisions, U.S. EPA needs to provide additional information regarding its use.

In particular, the contractor shall perform analyses related to effect of season and, depending on results, develop a benchmark method to adjust for season. The contractor shall also recalculate the benchmark on an ecoregional basis for 5 to 10 different ecoregions including Ecoregions 67, 68, 69, and 70, and any other datasets that can be used to develop the relationship between apparent background and the 5<sup>th</sup> centile of genera extirpation. The contractor shall also characterize the ratio of the ionic matrix of those datasets.

Documentation should include all the datasets, values, code, and metadata. Documentation should include not only the final results, but also for any intermediate work that led to the selection of the final outputs from this work assignment. These include but are not limited to alternate assessment endpoints, alternate methods, alternate exposure endpoints (e.g. using ions rather than specific conductivity), background approaches, extrapolation options (e.g. those used to develop or reported in the Applicability Report and Magnitude, Duration, Frequency Report), and documentation of information that may be used in manuscripts and presentations. Analyses are expected to produce commonly used plots, figures and supporting analyses, typically encountered when responding to reviewer comments of manuscripts and reports (e.g., analysis of variance, geographical analysis, various bootstrapping methods).

## **OBJECTIVES**

### **OBJECTIVE 1. ENSURING GOOD SCIENTIFIC PRACTICES**

Task 1: Provide good communication protocols, workplan, and QA/QC plan

Subtask 1.1: Work Plan and Cost Proposal

Subtask 1.2: Communication

Subtask 1.3: Quality Assurance/Quality Control (QA/QC) Plan

### **OBJECTIVE 2. ANALYSES**

## Task 2. PERFORM AND PROVIDE DOCUMENTATION OF STATISTICAL AND GEOGRAPHICAL ANALYSES

- Subtask 2.1. Perform analyses to evaluate effect of season and biological sample date
- Subtask 2.2. Provide a sensitivity analysis of restriction of ionic matrix on the XC95 and benchmark
- Subtask 2.3. Develop a method to assess uncertainty of estimates of natural background
- Subtask 2.4. Perform analyses to determine potential effect of ecoregion and associated apparent natural background
- Subtask 2.5. Perform analyses to determine influence of habitat on the lower portion of SSD

## OBJECTIVE 3. PERFORMANCE AND DOCUMENTATION OF ANALYSES

Task 3: Provide documentation of statistical and geographical analyses

- Subtask 3.1. Document all statistical code and products
- Subtask 3.2. Document written descriptions of methods and analyses

## OBJECTIVE 4. SUPPORT FOR COMPLETION OF REPORTS AND MANUSCRIPTS

Task 4: Finalize figures, tables, and text

- Subtask 4.1 Develop supporting materials

## **SPECIFIC TASKS**

### **OBJECTIVE 1. ENSURING GOOD SCIENTIFIC PRACTICES**

The work performed under this objective ensures that all work is credible and defensible.

#### **Task 1: Provide good communication protocols, workplan, and QA/QC plan**

##### **Subtask 1.1: Work Plan and Cost Proposal**

The Contractor shall provide a work plan including expertise and staffing and resources needed.

The Contractor shall identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment. The workplan shall also provide a schedule for completing each task and a cost proposal shall be provided to the COR.

##### **Subtask Deliverable 1.1: Workplan and Cost Proposal**

**Due:** 15 days after receipt of work assignment

##### **Subtask 1.2: Communication**

Within 2 days of receipt of the work assignment, the contractor shall schedule a conference call (not to exceed 1 hour) with the COR and appropriate (contractor) staff to clarify outstanding questions and confirm the schedule and specific tasks. The contractor shall provide brief verbal or email status updates to the COR every other week. The contractor

shall initiate additional communication with the COR should developments arise that will affect the conduct or schedule of any products.

**Subtask Deliverable 1.2: Conference Call**

**Due:** Within 2 days after receipt of the work assignment and as needed basis not to exceed two (2) per month

**Subtask 1.3: Quality Assurance/Quality Control (QA/QC) Plan**

The Contractor shall submit a EPA R-5 compliant Quality Assurance Project Plan (QAPP) in accordance with EPA Quality guidelines. Guidance for QAPP development include, “EPA QA Manual CIO 2105-P-01-0: EPA Quality Manual for Environmental Programs (QAPP)”, and “EPA Requirements for Quality Assurance Project Plans (QA/R-5)” available online at [www.epa.gov/quality](http://www.epa.gov/quality) and [www.epa.gov/quality/qs-docs/r5-final.pdf](http://www.epa.gov/quality/qs-docs/r5-final.pdf). Also, two QAPP templates are attached, a template for models and another template for data analysis. Each provides a template that pertains to this work and can be used to assist in the development of a QAPP. The QAPP shall address the quality assurance process and quality control procedures to produce the deliverables specified in Tasks 2, 3, & 4. The QAPP should demonstrate a clear understanding of the project’s goals/objectives/questions and issues and indicate how types, quantity, quality of data will be quality assured and maintained. The QAPP shall also ensure that metadata is compiled. The QAPP shall describe actions that would be taken to identify and mitigate any QA/QC issues should they arise. The QAPP will be reviewed and approved by the EPA Work Assignment Manager and the EPA Quality Assurance Manager.

**OBJECTIVE 2. ANALYSES**

**Task 2. Perform and provide documentation of statistical and geographical analyses**

The principal focus of this new work assignment is to provide analyses and documentation to support the development of a method and criteria for an ionic mixture measured as specific conductivity. The original method is described in “A Field Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams,” document number EPA/600/R 10/023F available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809>, heretofore, referred to as the *Conductivity Report*, and the *Applicability Report* and *Magnitude, Duration and Frequency Report* and manuscripts derived from the Conductivity Report.

**Subtask 2.1. Perform analyses to evaluated effect of season and biological sample date**

The current benchmark may be affected by the date that the biological sample was obtained and the ability to collect some species only in certain seasons. The contractor shall perform analyses related to effect of season and depending on results, revise the benchmark to adjust for season. Firstly, the contractor shall develop a method for evaluating if there is any effect in the current method with respect to an annual duration. If justified by the first analysis, the contractor shall develop a method to more accurately estimate either a March-June benchmark or annual average benchmark.

**Subtask Deliverable 2.2: Plots, metadata, R-code, descriptive text of methods**

**Due:** 30 days of approved work plan



### **Subtask 2.2. Provide a sensitivity analysis of restriction of ionic matrix on the XC95 and benchmark**

The current characterization includes a table of quantiles of ions but not of the ratios of ions.

The contractor shall characterize the ratio of the ionic matrix in several ways. The contractor shall provide a (1) graphical plot of  $\text{HCO}_3^- + \text{SO}_4^{2-}$  against  $\text{Cl}^-$  as mg/L, moles, and microequivalent units, and (2) plot of ratio of  $(\text{HCO}_3^- + \text{SO}_4^{2-}) / \text{Cl}^-$  and specific conductivity for mg/L, moles, and microequivalent units. The contractor shall also more specifically characterize the existing criterion of  $\text{HCO}_3^- + \text{SO}_4^{2-} / \text{Cl}^- \geq 1$  by evaluating outliers and attempting to provide a statistical boundary to the population of sites.

**Subtask Deliverable 2.2:** Plots, metadata, R-code, descriptive text of methods

**Due:** 20 days of approved work plan

### **Subtask 2.3. Develop a method to assess uncertainty of estimates of natural background**

The current draft of the Applicability Report includes a weight-of-evidence analysis that is triggered when apparent natural background exceeds the benchmark. EPA would like to revise this to be triggered when the background in a new area is greater than the background in the developmental data set. The contractor shall estimate background and an appropriate confidence interval for Ecoregions 67, 68, 69, and 70 and any other ecoregion analyzed in associated with subtask 2.4 using the 25<sup>th</sup> centile of all sites (or randomly selected sites) and the 75<sup>th</sup> centile of reference sites if available. The number of ecoregions shall not exceed 10. A statistical threshold shall be estimated so that new areas can be compared to the original data set. The contractor shall consider the sample size of the data set from a new area in summarizing the method.

**Subtask Deliverable 2.3:** Plots, metadata, R-code, descriptive text of methods

**Due:** 30 days of approved work plan for ecoregions 67, 68, 69 and 70, and 60 days for other ecoregions

### **Subtask 2.4. Perform analyses to determine potential effect of ecoregion and associated apparent natural background**

The benchmark currently is applicable to the geographic area described by the dataset used to develop the benchmark. The Contractor shall develop a predictive model to estimate an HC05 from background conductivity; thereby providing benchmarks for all places with a similar ionic mixture. The Contractor shall develop HC05 values for Ecoregions with approximately 10 ecoregions representing a range of background s between 30  $\mu\text{S}/\text{cm}$  and 600  $\mu\text{S}/\text{cm}$  and from them develop a model to estimate HC05 for any background. The Contractor shall also provide proper documentation of all datasets, outputs, and statistical code as described in Task 2.

**Subtask 2.4. Deliverable:** Feasibility assessment and Final materials

**Due:** Feasibility assessment 60 days, final materials at completion of work assignment

### **Subtask 2.5. Perform analyses to determine influence of habitat on the lower portion of SSD**

Several analyses of the potential effect of confounding by poor habitat, EPA wants to assure those results. The Contract shall perform a multivariate analysis using only sites where the 50 most sensitive genera occur. The contractor shall also prepare a contingency table of using the 50 most sensitive genera and habitat. The contractor shall perform 3-4 different analyses depending on the findings of the two tests described above.

**Subtask 2.5.** Plots, metadata, R-code, descriptive text of methods

**Due:** 40 days of approved work plan

### **OBJECTIVE 3. PERFORMANCE AND DOCUMENTATION OF ANALYSES**

#### **Task 3: Provide documentation of statistical and geographical analyses**

##### **Subtask 3.1. Document all statistical code and products**

All work submitted by the contractor should be reproducible and transparent. The contractor should provide complete metadata for all manipulations of datasets, documentation of all figures, tables, and analyses performed in conjunction with this work assignment. Datasets and corresponding data dictionaries used for all the analyses shall be provided as flat files (e.g., tab, or comma-delimited) as well as a data dictionary. The contractor shall use the open source software "R" for statistical analyses unless otherwise specified with concurrence from the COR. Annotated code and data sets should be retained and submitted when providing results. Results and figures should be provided as code for the statistical package language that was used and in ppt, pdf, eps or other image software. Formulae for fitted lines should be provided. Any spatial analysis, that is, the use of Geographic Information System (GIS) tools, functions, geoprocessing, and operations (e.g. map overlay, spatial query) of geographically-referenced data, shall include either a flow chart or model-builder steps that depict the data management and analysis of the GIS layers. If any scripts are used in the GIS analysis, those scripts should be annotated, retained, and submitted when providing results. Any maps produced from a GIS system shall include the source information of the data shown in the map and map projection, which may be in Adobe PDF files or ESRI format as dictated by technical direction.

**Subtask Deliverable 3.1:** Excel spreadsheet electronically linked to relevant files

**Due:** at completion of work assignment

##### **Subtask 3.2. Document written descriptions of methods and analyses**

Most of the analyses will require written texts that describe the rationale and interpretation of the analyses. Draft and final versions shall incorporate feedback from the COR common to all previous interim deliverables. Moreover, some back and forth discussions and editing via E-mail between the COR and contractor are expected before reaching consensus on the interim and final deliverables. Whenever possible the datasets should be provided in Excel, whenever possible, and tab delimited flat files, when it would be useful for running the provided computer code.

**Subtask Deliverable 3.2:** Final materials

**Due: at completion** of work assignment

#### **OBJECTIVE 4. SUPPORT FOR COMPLETION OF REPORTS AND MANUSCRIPTS**

##### **Task 4: Finalize figures, tables, and text**

Updated figures and tables are needed to address reviewer comments on the applicability report, magnitude, frequency and duration reports, and water quality criterion documents and any manuscripts that may result from them. In addition descriptive text will be needed for figure legends, methods sections and results.

##### **Subtask Deliverable 4.1: Develop supporting materials**

EPA expects to request analyses to verify, replace, correct or format a small percentage (<20%) from each document of figures, maps, or tables and about 5-10 more substantive corrections as well as documentation as described in Task 2 and 3. Written text is expected to be no more than 20 pages of new text and review and comment on 100 or more pages.

**Subtask 4.1. Deliverable:** Final graphs, plots, tables, text, and metadata

**Due: at completion** of work assignment

#### **MILESTONES AND DELIVERABLES**

The Contractor shall have a conference call with the COR at the initiation of the Work Assignment Amendment to discuss and clarify the objectives and specific tasks of this work assignment. The Contractor shall have monthly conference calls with the COR to report on progress.

The Contractor shall provide drafts of products as they are completed or by the dates on the schedule of deliverables, which follows.

##### **Task, Milestone, and Deliverable Date**

**Deliverable 1.1:** Workplan and Cost Proposal—**15 days** after receipt of work assignment amendment

**Deliverable 1.2:** Conference Call—within **2 days** after receipt of work assignment

**Deliverables 1.3:** QA/QC plan and reports—QA/QC plan within **30 days** after receipt of work plan and final report **at completion** of work assignment

**Deliverable 2.1:** Seasonal plots, metadata, R-code, descriptive text of methods— within **30 days** of approved work plan

**Deliverable 2.2:** Ionic matrix plots, metadata, R-code, descriptive text of methods—within **20 days** of approved work plan

**Deliverable 2.3:** Background uncertainty plots, metadata, R-code, descriptive text of methods — within **30 days** of approved work plan

**Deliverables 2.4:** Predictive model feasibility assessment and Final materials Feasibility assessment—within **60 days**, final materials **at completion** of work assignment

**Deliverables 2.5:** Habitat plots, metadata, R-code, descriptive text of methods —within **40 days**, final materials **at completion** of work assignment

**Deliverable 3.1:** Research documentation as Excel spreadsheet electronically linked to relevant files— **at completion** of work assignment.

**Deliverable 3.2:** Descriptive texts. Final materials— **at completion** of work assignment

**Deliverable 4.1.:** Final graphs, plots, tables, text, and metadata for documents— **at completion** of work assignment

## **V. Conflict of Interest:**

The Contractor warrants that, to the best of the Contractor’s knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the COR immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the COR any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the COR. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the COR, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the COR of any contrary action to be taken.

## **VI. Management Controls**

1. The EPA will review and provide comments on any updates on the Work Plan prepared for this work assignment amendment.

2. The contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting will take place if the contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
3. Technical Direction: The COR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment amendment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment and amendment. The technical direction shall be issued in writing by the COR within five working days of verbal issuance. This will be forwarded to the Project Officer (PO) and CO for their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables.

## **VII. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT AMENDMENT:**

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

- A. Formulation of Agency policy
- B. Selection of Agency priorities
- C. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment or amendment, the Contractor shall immediately contact the PO or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment amendment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

## APPENDIX D

### Joint Quality Management/Quality Assurance Project Plan (JQM/QAPP) for Data Analysis

(Insert Project Name)

**1. Title and Approval Page**

*Include signatures lines for the contractor, his/her quality system personnel, the NCEA project officer, and his/her quality assurance coordinator.*

**2. Quality System Components**

*Describe the contractor's current organizational quality assurance program, including but not limited to:*

- a. Who has responsibility for the quality control of projects?
- b. Where is this person in the organizational hierarchy?
- c. What quality control and assurance procedures are planned or in place for projects like the proposed, and are these procedures documented?
- d. How does the person responsible for quality assess and document the quality control exercised in projects and implement any necessary corrective actions, including those that require approval from the project's client?

**3. Project Definition and Background**

*This section identifies the client and describes the project, its scope, its goals, and any research problems attendant to it.*

**4. Project Design and Organization and the Capabilities of the Researcher**

*Briefly describe the project's design and organization; indicate who has responsibility for the various tasks, including his/her credentials that are applicable to this project. Document how any items and services procured under this project will be certified of good quality and applicable to the needs of the project.*

**5. Description of Project Areas and Relative Quality Control Processes, including but not limited to**

*(Note: Do not leave any of the items below blank; specify any item that does not pertain to this project):*

- a. Data analysis, including a rationale for the type and number of data runs; include software used and data analysis techniques employed;
- b. Compliance with any data input characteristics required by the project;
- c. Verification of the source and quality of the original data, including the quality control procedures used in the collection of the original data;
- d. Data characteristics and parameters such as: criteria for data acceptance or rejection and any modifications made to the original data necessitated by the present project;
- e. Input/output of data, data format conventions, data conversion issues, and data maintenance and archiving procedures; and
- f. Constraints placed on the data.

**6. Project Review During Operation**

*Describe any processes for testing for quality problems within this project that are not covered under 2. c and 2.d. above. How will the success of the project be assessed? If this project specifies acceptance criteria for products, how will these be met?*

# **Joint Management/Quality Assurance Project Plan (JQM/QAPP) for Model Development, Model Evaluation, and Model Maintenance**

**(Insert Project Name)**

## **1. Title and Approval Page**

*Include signature lines for the contractor, his/her quality system personnel, the NCEA project officer, and his/her quality assurance coordinator.*

## **2. Quality System Components**

*Describe the contractor's current organizational quality assurance program, including but not limited to:*

- a. Who has responsibility for the quality control of projects?
- b. Where is this person in the organizational hierarchy?
- c. What quality control and assurance procedures are planned or in place for projects like the proposed, and are these procedures documented?
- d. How does the person responsible for quality assess and document the quality control exercised in projects and implement any necessary corrective actions, including those that require approval from the project's client?

## **3. Project Definition and Background**

*This section identifies the client and describes the project, its scope, its goals, and any research problems attendant to it.*

## **4. Project Design and Organization and the Capabilities of the Researcher**

*Briefly describe the project's design and organization; indicate who has responsibility for the various tasks, including his/her credentials that are applicable to this project. Document how any items and services procured under this project will be certified of good quality and applicable to the needs of the project.*

## **5. Description of Project Areas and Relative Quality Control Processes, including but not limited to**

*(Note: Do not leave any of the items below blank; specify any item that does not pertain to this project):*

- a. Model documentation and version control:
  - (1) model description; and
  - (2) model functionality and quality control using testing, including problems and their resolution
- b. Quality of input/output data:
  - (1) documenting the source and quality of data taken from other sources for use in the proposed work;
  - (2) documenting the reasons for and procedures used in modifying information from other sources; and

- (3) documenting the sources, assumptions, and quality of any data generated by the proposed work (data validation).

c. Model maintenance:

- (1) modifying the model to correct faults, improve performance or other attributes, or adapt to a changed environment; model may include data processing, analysis, visualization code, framework code etc;
- (2) preservation documentation, verification, validation and configuration management applied during the evolution of the model once its initial operational version has been released; and
- (3) enhancements to the model, problem fixes, porting problems, and retesting procedures.

**6. Project Review During Operation**

*Describe any processes for testing for quality problems within this project that are not covered under 2. c and 2.d. above. How will the success of the project be assessed? If this project specifies acceptance criteria for products, how will these be met?*



**EPA**United States Environmental Protection Agency  
Washington, DC 20460**Work Assignment**

Work Assignment Number

0-05

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2013

Base ☒

Option Period Number

Title of Work Assignment/SF Site Name

Support for Mountaintop and Co

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

Purpose:

☐

Work Assignment

☐

Work Assignment Close-Out

☐

Work Assignment Amendment

☐

Incremental Funding

☒

Work Plan Approval

Period of Performance

From 09/30/2012 To 09/01/2013

Comments:

☐

Superfund

Accounting and Appropriations Data

☒

Non-Superfund

SFO  
(Max 2)☐

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

## Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2013

Cost/Fee: \$0.00

LOE:

This Action:

\$69,994.30

Total:

\$69,994.30

## Work Plan / Cost Estimate Approvals

Contractor WP Dated: 12/21/2012

Cost/Fee: \$74,730.00

LOE: 772

Cumulative Approved:

Cost/Fee: \$74,731.00

LOE: 772

Work Assignment Manager Name Susan Cormier

Branch/Mail Code:

(Signature)

(Date)

Phone Number 513-569-7995

FAX Number:

Project Officer Name Sharon Boyde

Branch/Mail Code:

(Signature)

(Date)

Phone Number: 703-347-8576

FAX Number: 703-374-8696

Other Agency Official Name

Branch/Mail Code:

(Signature)

(Date)

Phone Number:

FAX Number:

Contracting Official Name Mark Cranley

Branch/Mail Code: CPOD

(Signature)

(Date)

Phone Number: 513-487-2351

FAX Number: 513-487-2109



United States Environmental Protection Agency  
Washington, DC 20460

## Work Assignment

Work Assignment Number

0-05

☐ Other ☒ Amendment Number:

000001

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2013

Base ☒ Option Period Number

Title of Work Assignment/SF Site Name

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

Purpose:

☐

Work Assignment

☐

Work Assignment Close-Out

☒

Work Assignment Amendment

☐

Incremental Funding

☐

Work Plan Approval

Period of Performance

From 09/30/2012 To 09/01/2013

Comments:

☐

Superfund

Accounting and Appropriations Data

☒

Non-Superfund

SFO  
(Max 2)

☐

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

### Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2013

Cost/Fee:

LOE:

This Action:

Total:

### Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Susan Cormier

Branch/Mail Code:

Phone Number 513-569-7995

FAX Number:

(Signature)

(Date)

Project Officer Name Sharon Boyde

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

(Signature)

(Date)

Other Agency Official Name

Branch/Mail Code:

Phone Number:

FAX Number:

(Signature)

(Date)

Contracting Official Name Mark Cranley

Branch/Mail Code: CPOD

Phone Number: 513-487-2351

FAX Number: 513-487-2109

(Signature)

07/09/13  
(Date)

**Tetra Tech, Inc.**  
**EP-C-12-060**  
**Amendment to Work Assignment 0-05**

**TITLE: Support for Conductivity Criterion Efforts**

**PERIOD OF PERFORMANCE:** CO Approval thru September 29, 2013

**WORK ASSIGNMENT MANAGER**

Susan Cormier, Ph.D.  
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**ALTERNATE**

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**INTRODUCTION**

The principal focus of this amendment to work assignment 0-05 is to provide analyses and documentation to support the development of a method and criterion for an ionic mixture measured as specific conductivity. The original method is described in "A Field Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams," document number EPA/600/R 10/023F available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809>, heretofore, referred to as the *Conductivity Report*, and reports and manuscripts derived from the *Conductivity Report*. EPA will also provide the drafts of the two source white papers that will be used to inform the development of a water quality criterion for conductivity: *Development of Maximum Magnitude, and Duration and Frequency Parameters for Field based Conductivity Benchmark*, hereafter referred to as the *Magnitude, Duration, and Frequency Report* and

*Regional Applicability of a Field Based Aquatic Life Benchmark for Conductivity*, hereafter referred to as the *Applicability Report*.

The Conductivity Report adapts the standard U.S. EPA methodology for deriving ambient water quality criteria. Rather than use toxicity test results, the adaptation uses field data to determine the loss of 5% of genera from streams. The method is applied to derive effect benchmarks for dissolved salts as measured by specific conductivity in Appalachian streams using data from West Virginia. This benchmark is intended to protect the biological integrity of waters in the region. Field data were used because sufficient and appropriate laboratory data were not available and because high quality field data were available to relate specific conductivity to effects on biotic communities. Supplementary documentation is supplied in the form of 10 appendices: a general causal assessment for effects of ionic stress, analysis of potential confounding, figures of individual genera response to ionic stress, a validation of using an independent dataset from KY, and a landscape analysis of sources and increased levels of conductivity. In order for EPA to enable this work to be used in policy decisions, U.S. EPA needs to provide additional information regarding its use.

This amendment describes additional work within WA 0-05 which needs to be expanded in order to address analyses made necessary by unanticipated internal review comments. The contractor shall expand analyses related to effect of season that were more than expected for the original work assignment.. The contractor shall expand the model to estimating the criterion from ecoregional background from 5 to 20 ecoregions. The contractor shall also characterize the ratio of the ionic matrices of those datasets. In addition, the contractor shall perform and document analyses for an index of intolerant genera used to assess confounders, detailed analyses of seasonality and ionic matrix, verification of the background matching approach for geographical applicability, derivation of an alternative exposure measure, and analyses needed to complete the fish conductivity report. The contractor shall prepare final materials for the external review draft.

Documentation should include all the datasets, values, code, and metadata. Documentation should include not only the final results, but also for any intermediate work that led to the selection of the final outputs from this work assignment. These include but are not limited to alternate assessment endpoints, alternate methods, alternate exposure endpoints (e.g. using ions rather than specific conductivity), background approaches, extrapolation options (e.g. those used to develop or reported in the Applicability Report and Magnitude, Duration, Frequency Report), and documentation of information that may be used in manuscripts and presentations. Analyses are expected to produce commonly used plots, figures and supporting analyses, typically encountered when responding to reviewer comments of manuscripts and reports (e.g., analysis of variance, logistic regression, geographical analysis, various bootstrapping methods).

## **OBJECTIVES**

### **OBJECTIVE 1. ENSURING GOOD SCIENTIFIC PRACTICES**

Task 1: Provide good communication protocols, workplan, and QA/QC plan

- Subtask 1.1: Amendment Work Plan and Cost Proposal
- Subtask 1.2: Communication
- Subtask 1.3: Quality Assurance/Quality Control (QA/QC) Plan

## **OBJECTIVE 2. ANALYSES**

### **Task 2. PERFORM AND PROVIDE DOCUMENTATION OF STATISTICAL AND GEOGRAPHICAL ANALYSES**

- Subtask 2.1. Provide step-by-step method and perform analyses to evaluate effect of season and biological sample date-for new criterion models
- Subtask 2.2. Provide a sensitivity analysis of restriction of ionic matrix on the XC95 and benchmark-for new criterion models
- Subtask 2.3. Develop a method to assess uncertainty of estimates of natural background-THIS TASK IS COMPLETED AND WILL ONLY RESUME IF REVIEW COMMENTS REQUIRE THEM.
- Subtask 2.4. Verification of the background matching approach for geographical applicability(related to Subtask 2.4 of original workplan)
- Subtask 2.5. Subtask 2.5. Perform analyses to determine influence of habitat on the lower portion of SSD-THIS TASK IS COMPLETED AND WILL ONLY RESUME IF REVIEW COMMENTS REQUIRE THEM
- Subtask 2.6. Derivation of an alternative exposure measure
- Subtask 2.7. Analyses needed to complete the fish conductivity report based on external review comments
- Subtask 2.8: Tables and figures for external review draft of criterion document.

## **OBJECTIVE 3. PERFORMANCE AND DOCUMENTATION OF ANALYSES**

### **Task 3: Provide documentation of statistical and geographical analyses**

- Subtask 3.1. Document all statistical code and products
- Subtask 3.2. Document written descriptions of methods and analyses

## **OBJECTIVE 4. SUPPORT FOR COMPLETION OF REPORTS AND MANUSCRIPTS**

- Task 4: Finalize figures, tables, and text
- Subtask 4.1 Develop supporting materials

## **SPECIFIC TASKS**

### **OBJECTIVE 1. ENSURING GOOD SCIENTIFIC PRACTICES**

The work performed under this objective ensures that all work is credible and defensible.

#### **Task 1: Provide good communication protocols, workplan, and QA/QC plan**

##### **Subtask 1.1: Amendment Work Plan and Cost Proposal**

The Contractor shall provide a work plan including expertise and staffing and resources needed.

The Contractor shall identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment. The workplan

shall also provide a schedule for completing each task and a cost proposal shall be provided to the COR. The original workplan can be used as a template as most of the new work is extension of the original work.

**Subtask Deliverable 1.1: Update Workplan and Cost Proposal as Necessary**

**Due:** 15 days after receipt of work assignment

**Subtask 1.2: Communication**

Within 2 days of receipt of the work assignment, the contractor shall schedule a conference call (not to exceed 1 hour) with the COR and appropriate (contractor) staff to clarify outstanding questions and confirm the schedule and specific tasks. The contractor shall provide brief verbal or email status updates to the COR every other week. The contractor shall initiate additional communication with the COR should developments arise that will affect the conduct or schedule of any products.

**Subtask Deliverable 1.2: Conference Call**

**Due:** Within 2 days after receipt of the work assignment and as needed basis not to exceed two (2) per month

**Subtask 1.3: Quality Assurance/Quality Control (QA/QC) Plan**

The contractor shall prepare a QA/QC plan. The QA plan should demonstrate a clear understanding of the project's goals/objectives/questions and issues. The QA/QC plan shall also indicate how types, quantity, quality of data will be quality assured and maintained. The QA/QC plan shall also ensure that metadata is compiled. The QA/QC plan shall describe actions would be taken to identify and mitigate any QA/QC issues should they arise.

**Subtask Deliverable 1.3: QA/QC plan**

**Due:** Update QA/QC plan within 30 days after receipt of work assignment if there are changes to the current plan or and as needed if problems arise.

**OBJECTIVE 2. ANALYSES**

**Task 2. Perform and provide documentation of statistical and geographical analyses**

The principal focus of this amendment is to provide analyses and documentation to support the development of a method and criteria for an ionic mixture measured as specific conductivity. The original method is described in "A Field Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams," document number EPA/600/R 10/023F available at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809>, heretofore, referred to as the *Conductivity Report*, and the *Applicability Report* and *Magnitude, Duration and Frequency Report* and manuscripts derived from the Conductivity Report.

**Subtask 2.1. Provide step-by-step method and perform analyses to evaluate effect of season and biological sample date for additional models**

The current benchmark may be affected by the date that the biological sample was obtained and the ability to collect some species only in certain seasons. The contractor has performed analyses related to effect of season and based on these results, EPA requires that method be provided in an appendix of the criterion document for illustrative purposes. Using the Ecoregion 69 dataset, the contractor shall develop an appendix that succinctly illustrates implementation by describing how to calculate and XC95, estimate the HC05, the criterion for Ecoregion 69 including the weighting for the derivation of the criterion and weighting for both season and conductivity regime. The arithmetic should be easy enough for a regional or state scientists to perform. The contractor shall also evaluate weighting versus no weighting for all new models requested as part of the internal review.

**Subtask Deliverable 2.1:** Seasonal plots—within 15 days of approved work plan

Metadata, R-code, descriptive text of methods—within 45 days of approved work plan

**Subtask 2.2. Provide a sensitivity analysis of restriction of ionic matrix on the XC95 and benchmark** for new criterion models

The current characterization includes a table of quantiles of ions but not of the ratios of ions.

The contractor has characterized the ratio of the ionic matrix in several ways. The contractor shall provide a (1) graphical plot of  $\text{HCO}_3^- + \text{SO}_4^{2-}$  against  $\text{Cl}^-$  as mg/L, moles, and microequivalent units, and (2) plot of ratio of  $(\text{HCO}_3^- + \text{SO}_4^{2-}) / \text{Cl}^-$  and specific conductivity for mg/L, moles, and microequivalent units. The contractor has specifically characterized the existing criterion of  $\text{HCO}_3^- + \text{SO}_4^{2-} / \text{Cl}^- \geq 1$  by evaluating outliers and attempting to provide a statistical boundary to the population of sites. For this amendment the contractor will use the developed method to provide graphical plots of  $\text{HCO}_3^- + \text{SO}_4^{2-}$  against  $\text{Cl}^-$  as mg/L for Ecoregions 68, 69, and 70 for the criterion document and for the ecoregions used in the model to predict a criterion from background (approximately 15-20 ecoregions).

**Subtask Deliverable 2.2:** Ionic matrix plots—within 45 days of approved work plan

Metadata, R-code, descriptive text of methods—within 70 days of approved work plan

**Subtask 2.3. Develop a method to assess uncertainty of estimates of natural background - THIS TASK IS COMPLETED AND WILL ONLY RESUME IF REVIEW COMMENTS REQUIRE THEM.**

The current draft of the Applicability Report includes a weight-of-evidence analysis that is triggered when apparent natural background exceeds the benchmark. EPA would like to revise this to be triggered when the background in a new area is greater than the background in the developmental data set. The contractor shall estimate background and an appropriate confidence interval for Ecoregions 67, 68, 69, and 70 and any other ecoregion analyzed in associated with subtask 2.4 using the 25<sup>th</sup> centile of all sites (or randomly selected sites) and the 75<sup>th</sup> centile of reference sites if available. The number of ecoregions shall not exceed 10. A statistical threshold shall be estimated so that new areas can be compared to the original data set. The contractor shall consider the sample size of the data set from a new area in summarizing the method.

**Subtask Deliverable 2.3:** Plots, metadata, R-code, descriptive text of methods

**Due:** Background uncertainty plots—within 15 days of approved work plan  
Metadata, R-code, descriptive text of methods—within 45 days of approved work plan

30 days of approved work plan for ecoregions 67, 68, 69 and 70, and 60 days for other ecoregions

**Subtask 2.4. Verification of the background matching approach for geographical applicability** (related to Subtask 2.4 of original workplan).

In order to increase confidence that the background conductivity matching approach can reliably identify an applicable criterion for a different ecoregion, the contractor shall verify that the applicable criterion for Ecoregion 68 is similar to what the criterion would be if it were actually calculated for Ecoregion 68. And the contractor will develop an ssd and predicted HC05 using genera in ecoregion 68 and XC95 values from the ecoregion 69 dataset. The calculated and predicted criteria will be for verification of the method and are not intended as recommended criteria. The contractor has developed a dataset for Ecoregion 68 by combining several data sources. For this amendment, the contractor shall provide the HC05 for Ecoregion 68 and supporting analyses similar to those for the calculated criteria for Ecoregions 69 and 70.

**Subtask Deliverable 2.4:** Set of plots and tables for Ecoregion 68 —within 15 days of approved work plan

Metadata, R-code, descriptive text of methods—within 45 days of approved work plan

**Subtask 2.5. Perform analyses to determine influence of habitat on the lower portion of SSD-THIS TASK IS COMPLETED AND WILL ONLY RESUME IF REVIEW COMMENTS REQUIRE THEM**

Several analyses of the potential effect of confounding by poor habitat, EPA wants to assure those results. The Contract shall perform a multivariate analysis using only sites where the 50 most sensitive genera occur. The contractor shall also prepare a contingency table of using the 50 most sensitive genera and habitat. The contractor shall perform 3-4 different analyses depending on the findings of the two tests described above.

**Subtask 2.5.** Plots, metadata, R-code, descriptive text of methods

**Due:** 40 days of approved work plan

**Subtask 2.6. Derivation of an alternative exposure measure**

In a memorandum to the Office of Water in 2011, ORD provided an alternative to conductivity as the measure of ionic strength which was the combined mass of bicarbonate plus sulfate ions on a mg/L basis. For this amendment, the contractor shall perform analyses using the Ecoregion 69 data set or if necessary due to constraints of the data, using the combined data sets of Ecoregion 69 and 70, resulting in an HC05 for bicarbonate plus sulfate. These analyses will be inserted into an appendix to the criterion document that will be provided by EPA.

**Subtask Deliverable 2.6:** Set of plots and tables for alternative measure —within 15 days of approved work plan



Metadata, R-code, descriptive text of methods—within 45 days of approved work plan

**Subtask 2.7. Analyses needed to complete the fish conductivity report based on external review comments**

The contractor has provided analyses for an EPA developed fish data set for the combined Ecoregions 67, 68, 69, 70. For the amendment, the contractor shall provide updates to these analyses in response to internal and external review comments, and provide final figures and tables

**Subtask Deliverable 2.7:** Set of plots and tables for fish endpoint —within 70 days of approved work plan

Metadata, R-code, descriptive text of methods—at completion of work assignment

**Subtask 2.8. Tables and figures for external review draft of criterion document.**

The EPA is soliciting comments on the scientific merits and execution of the regional criterion for conductivity. Some new analyses, tables and figures are expected to be needed to address reviewer comments. EPA estimates that approximately 10-20 new analyses will be needed and 10-40 plots or figures, primarily replicates for each ecoregion or minor changes to the appearance of the figures.

**Subtask Deliverable 2.8:** Final plots and tables for external review draft —within 70 days of approved work plan

Metadata, R-code, descriptive text of methods—at completion of work assignment

## **OBJECTIVE 3. PERFORMANCE AND DOCUMENTATION OF ANALYSES**

### **Task 3: Provide documentation of statistical and geographical analyses**

#### **Subtask 3.1. Document all statistical code and products**

All work submitted by the contractor should be reproducible and transparent. The contractor should provide complete metadata for all manipulations of datasets, documentation of all figures, tables, and analyses performed in conjunction with this work assignment. Datasets and corresponding data dictionaries used for all the analyses shall be provided as flat files (e.g., tab, or comma-delimited) as well as a data dictionary. The contractor shall use the open source software "R" for statistical analyses unless otherwise specified with concurrence from the COR. Annotated code and data sets should be retained and submitted when providing results. Results and figures should be provided as code for the statistical package language that was used and in ppt, pdf, eps or other image software. Formulae for fitted lines should be provided. Any spatial analysis, that is, the use of Geographic Information System (GIS) tools, functions, geoprocessing, and operations (e.g. map overlay, spatial query) of geographically-referenced data, shall include either a flow chart or model-builder steps that depict the data management and analysis of the GIS layers. If any scripts are used in the GIS analysis, those scripts should be annotated, retained, and submitted when providing results. Any maps produced from a GIS system

shall include the source information of the data shown in the map and map projection, which may be in Adobe PDF files or ESRI format as dictated by technical direction.

**Subtask Deliverable 3.1:** Excel spreadsheet electronically linked to relevant files

**Due:** at completion of work assignment

**Subtask 3.2. Document written descriptions of methods and analyses**

Most of the analyses will require written texts that describe the rationale and interpretation of the analyses. Draft and final versions shall incorporate feedback from the COR common to all previous interim deliverables. Moreover, some back and forth discussions and editing via E-mail between the COR and contractor are expected before reaching consensus on the interim and final deliverables. Whenever possible the datasets should be provided in Excel, whenever possible, and tab delimited flat files, when it would be useful for running the provided computer code.

**Subtask Deliverable 3.2:** Final materials

**Due:** at completion of work assignment

**OBJECTIVE 4. SUPPORT FOR COMPLETION OF REPORTS AND MANUSCRIPTS**

**Task 4: Finalize figures, tables, and text**

Updated figures and tables are needed to address reviewer comments on the applicability report, magnitude, frequency and duration reports, and water quality criterion documents and any manuscripts that may result from them. In addition descriptive text will be needed for figure legends, methods sections and results.

**Subtask Deliverable 4.1: Develop supporting materials**

EPA expects to request analyses to verify, replace, correct or format a small percentage (<20%) from each document of figures, maps, or tables and about 5-10 more substantive corrections as well as documentation as described in Task 2 and 3. Written text is expected to be no more than 20 pages of new text and review and comment on 100 or more pages.

**Subtask 4.1. Deliverable:** Final graphs, plots, tables, text, and metadata

**Due:** at completion of work assignment

**MILESTONES AND DELIVERABLES**

The Contractor shall have a conference call with the COR at the initiation of the Work Assignment Amendment to discuss and clarify the objectives and specific tasks of this work assignment. The Contractor shall have monthly conference calls with the COR to report on progress.

The Contractor shall provide drafts of products as they are completed or by the dates on the schedule of deliverables, which follows.

**Task, Milestone, and Deliverable Date**

**Deliverable 1.1:** Workplan and Cost Proposal—**15 days** after receipt of work assignment amendment

**Deliverable 1.2:** Conference Call—within **2 days** after receipt of work assignment

**Deliverables 1.3:** QA/QC plan and reports—QA/QC plan if there are any changes to the current plan and final report **at completion** of work assignment

**Deliverable 2.1:** Seasonal plots—within **15 days** of approved work plan  
Metadata, R-code, descriptive text of methods—within **45 days** of approved work plan

**Deliverable 2.2:** Ionic matrix plots—within **15 days** of approved work plan  
Metadata, R-code, descriptive text of methods—within **45 days** of approved work plan

**Deliverable 2.3:** Background uncertainty plots—none for this amendment

**Deliverables 2.4:** Verification of background-matching approach—within **15 days** of approved work plan  
Metadata, R-code, descriptive text of methods—within **45 days** of approved work plan

**Deliverables 2.5:** Habitat plots, — none for this amendment

**Deliverable 2.6:** Set of plots and tables for alternative measure —within **15 days** of approved work plan  
Metadata, R-code, descriptive text of methods—within **45 days** of approved work plan

**Deliverable 2.6:** Set of plots and tables for fish endpoint —within **70 days** of approved work plan  
Metadata, R-code, descriptive text of methods—**at completion** of work assignment

**Deliverable 2.8:** Final plots and tables for external review draft —within 70 days of approved work plan  
Metadata, R-code, descriptive text of methods—at completion of work assignment

**Deliverable 3.1:** Research documentation as Excel spreadsheet electronically linked to relevant files— **at completion** of work assignment.

**Deliverable 3.2:** Descriptive texts. Final materials— **at completion** of work assignment

**Deliverable 4.1.:** Final graphs, plots, tables, text, and metadata for documents— **at completion** of work assignment

## **V. Conflict of Interest:**

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the COR immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the COR any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the COR. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the COR, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the COR of any contrary action to be taken.

## **VI. Management Controls**

1. The EPA will review and provide comments on any updates on the Work Plan prepared for this work assignment amendment.
2. The contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting will take place if the contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
3. Technical Direction: The COR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment amendment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment and amendment. The technical direction shall be issued in writing by the COR within five working days of verbal issuance. This will be forwarded to the Project Officer (PO) and CO for their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables.

## **VII. NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT AMENDMENT:**

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

- A. Formulation of Agency policy
- B. Selection of Agency priorities
- C. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment or amendment, the Contractor shall immediately contact the PO or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment amendment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-05								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Support for Mountaintop and Co								
Purpose: <input type="checkbox"/> Work Assignment <input checked="" type="checkbox"/> Work Assignment Amendment <input checked="" type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW Period of Performance From 09/30/2012 To 09/01/2013								
Comments:										
<input type="checkbox"/> Superfund      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period: 09/30/2012 To 09/29/2013		Cost/Fee:		LOE:						
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 07/18/2013		Cost/Fee: 44,989.00		LOE: 462						
Cumulative Approved:		Cost/Fee: \$119,720.00		LOE: 1,234						
Work Assignment Manager Name Susan Cormier						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number 513-569-7995				
Project Officer Name Sharon Boyde						FAX Number:				
						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
						Phone Number:				
_____ (Signature) (Date)						FAX Number:				
						Branch/Mail Code: CP00				
Contracting Official Name Mark Cranley						Phone Number: 513-487-2351				
_____ (Signature) (Date)						FAX Number: 513-487-2109				

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-06								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period   09/30/2012   To   09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Adaptation Planning for Coral								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From   09/30/2012   To   09/29/2013								
Comments: The PWS included in this WA contains tasks that are anticipated to take place in Option Period 1. They are included to provide context to the work being tasked in the Base Period but should not be worked on or included in any Cost Proposals for the Base Period. Tasks 6d and there after are not to be worked on in the Base Period of this contract.										
<input type="checkbox"/> Superfund		Accounting and Appropriations Data								
		<input checked="" type="checkbox"/> Non-Superfund								
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012   To   09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:		LOE:				
Cumulative Approved:				Cost/Fee:		LOE:				
Work Assignment Manager Name   Jordan West						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
Project Officer Name   Sharon Boyde						Phone Number   703-347-8584				
_____ (Signature)						_____ (Date)				
Other Agency Official Name						FAX Number:				
_____ (Signature)						_____ (Date)				
Contracting Official Name   Mark Cranley						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

## **Performance Work Statement**

Tetra Tech, Inc.  
Contract EP-C-12-060  
Work Assignment No. 0-06

**TITLE:** Adaptation Planning for Coral Reefs in a Changing Climate

**PERIOD OF PERFORMANCE:** Award date through September 29, 2013

**WORK ASSIGNMENT MANAGER:** Jordan West  
Global Change Research Program  
US Environmental Protection Agency  
1200 Pennsylvania Ave., NW (8601P)  
Washington, DC 20460  
[west.jordan@epa.gov](mailto:west.jordan@epa.gov)  
703-347-8584 (voice)  
703-347-8694 (fax)

**ALTERNATE WAM :** Susan Julius  
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US Environmental Protection Agency  
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Washington, DC 20460  
[julius.susan@epa.gov](mailto:julius.susan@epa.gov)  
703-347-8619 (voice)  
703-347-8694 (fax)

**Work Assignment 0-06 is a crossover work assignment. Tasks 1a thru 6c will be completed under the Base Period of the contract. Tasks 6d thru 9e will be completed under Option Period 1 of the contract.**

## **INTRODUCTION**

Work in EPA's Global Change Impacts and Adaptation (GCIA) Program involves assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. Vulnerability and adaptation assessment activities in the GCIA aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this work assignment is to provide technical support to the GCIA Program and partners to advance frameworks and methods for adaptation planning for coral reef ecosystems.

Multiple recent efforts across government, non-governmental organizations, and academia have advanced the dialogue on general principles for adaptation to climate change at the national scale (e.g.,



National Ocean Policy Strategic Action Plan, National Wildlife, Fish & Plants Climate Adaptation Strategy); for particular management systems (e.g., NOAA Climate Smart Sanctuaries framework); and from an ecosystem/conservation perspective (e.g., EcoAdapt's Climate Savvy guide). While these efforts provide critical, general theoretical underpinnings for adaptation planning, there is a need to marry these top-down principles with emerging work on bottom-up adaptation planning by actual practitioners, in order to connect the theoretical to the practical.

EPA has been participating in a Climate Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework designed to be tractable and accessible for use by ecosystem managers. Case study applications of this type of framework, in combination with other approaches being experimented with on the ground, are needed in order to demonstrate utility for specific vulnerable ecosystems such as coral reefs. Thus the EPA GCIA Program -- in collaboration with EPA Region 9 and interagency members of the Climate Change Working Group of the U.S. Coral Reef Task Force -- is organizing a workshop in Honolulu slated for late 2013<sup>1</sup>. This 2.5 day workshop will use an expert elicitation approach (developed under this work assignment) to tailor the latest theoretical adaptation planning principles from the NWF framework -- as well as other approaches both theoretical and based on experimentation by early-adopter practitioners -- for practical use in coral reef management. At the workshop, managers and scientists from Federal agencies, states, territories, academia and non-governmental organizations will engage in a planning exercise, focusing on one or more case study coral reefs, to explore integration of climate change information into planning for Pacific coral reef management.

## **OBJECTIVES**

Under this work assignment, the Contractor shall provide technical support for literature/case study reviews, adaptation framework development, project Steering Committee coordination, workshop exercise planning, workshop exercise facilitation, lessons-learned analysis, and case study write-up for inclusion in a larger Reef Manager's Guide to Adaptation being developed in partnership with Australia's Great Barrier Reef Marine Park Authority. The objectives of this project are to: (1) carry out a review and synthesis of frameworks and case studies in order to tailor existing frameworks specifically for use in coral reef adaptation planning; (2) present the framework to coral reef stakeholders in the Pacific region for "testing" and critique through an expert elicitation exercise; (3) use stakeholder feedback along with additional literature/case study review as needed to revise the coral reef adaptation planning framework; and (4) produce a case study write-up (in the form of a journal article, book chapter, or online report) on the framework and lessons learned.

## **REQUIRED CONTRACTOR QUALIFICATIONS**

- 1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.
- 2) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef

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<sup>1</sup> Stakeholder workshop logistical support will be provided under a separate contract.

conservation and management, especially in the Pacific region and including knowledge of leading work on resilience and adaptation management focused on the Great Barrier Reef.

- 3) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.
- 4) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature).
- 5) Experience designing and facilitating expert scientific workshops.
- 6) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

#### **SPECIFIC TASKS:**

##### **Task 1a: Prepare Work Plan and Cost Estimate**

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

##### **Task 1b: Develop a Quality Assurance Project Plan**

The Contractor shall develop a Quality Assurance Project Plan (QAPP) documenting the quality processes and procedures for applicable tasks described in this Work Assignment and submit the QAPP for EPA WAM and QA Manager approval. The Contractor shall not perform any work on the new tasks under this Work Assignment until the QAPP is reviewed and approved by the EPA WAM and QA Manager. The QAPP shall include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at [http://www.epa.gov/quality/qa\\_docs.html](http://www.epa.gov/quality/qa_docs.html), see "[EPA Requirements for Quality Assurance Project Plans \(QA/R-5\)](#)".

**Deliverable 1a:** Work Plan and Cost Proposal

**Due:** 14 days after receipt

**Deliverable 1b:** QAAP

**Due:** within 7 days of work plan approval

The Contractor shall not begin Task 2 until the work plan is approved and Task 3 until the QAPP is approved.

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##### **Task 2: Establish and Maintain Communication**

Within seven days after work plan approval, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the EPA Work Assignment Manager (WAM) and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the WAM should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

**Deliverable 2a:** Kickoff call

**Due:** within 1 week of work plan approval

**Deliverable 2b:** Progress reports

**Due:** monthly

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### **Task 3: Project Steering Committee Support**

The Contractor shall provide logistical support to assist the WAM in coordinating a project Steering Committee (SC) for the project, consisting of 5-10 experts from EPA, other government agencies, and U.S. Coral Reef Task Force partners. (The membership list for the SC will be provided by the WAM.) The Contractor shall convene the SC to: (1) serve as advisors throughout the project; (2) recommend journal articles, reports, case studies and other materials to the Contractor for the literature/case study analysis and development of an adaptation planning framework/ and exercise (see Tasks 4 and 6); (3) attend an in-person SC meeting to discuss the literature review results, draft adaptation planning framework, and plan for a workshop exercise (see Task 5); (4) attend a stakeholder workshop at which the framework/exercise will be “tested” with practitioners (see Task 7); (5) provide input to revisions of the framework/exercise based on lessons learned from the workshop (see Task 8); and (6) provide input and review to the case study write-up (see Task 9). The Contractor shall work with the SC to provide this input through one kickoff call of 2 hours and (on average) monthly calls of 1 hour each, to be scheduled in consultation with the WAM. Calls will involve Contractor preparation of appropriate materials for discussion and feedback by the SC. Tentative points for SC feedback calls during the project are indicated in Tasks 4-9 below and in the table provided in the Milestones and Deliverables section (page 9).

**Deliverable 3a:** Agenda and materials for 2 hour SC kickoff call    **Due:** 1 week after Deliverable 2a

Based on discussions during the project kickoff call with the WAM (Deliverable 2a), the Contractor shall prepare an agenda and background materials for a 2 hour kickoff call with the SC.

**Deliverable 3b:** Convene the SC with a 2 hour kickoff call  
2a

**Due:** 3 weeks after Deliverable 2a

The Contractor shall schedule a SC kickoff call, send any advance materials developed in Deliverable 3a, and assist the WAM in hosting the call.

**Deliverable 3c:** Organize monthly briefing/feedback calls

**Due:** TBD with WAM

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#### **Task 4: Literature/Case Study Analysis and Draft Adaptation Planning Framework**

In this task the Contractor shall perform an analysis and synthesis of information from the published literature, case studies, workshop reports, training materials and other appropriate sources to compare general adaptation planning frameworks and methodologies with coral reef management planning efforts underway by early-adopter practitioners in the field. The purpose will be to “crosswalk” general adaptation frameworks (especially those presented in the Climate Smart Work Group’s guide to adaptation<sup>2</sup>) with “on the ground” efforts to address climate change by coral reef practitioners in the field in order to (1) assess the compatibility of general frameworks to the reality of practical application for coral reefs and (2) make adjustments to tailor a general framework more specifically for use in coral reef adaptation planning. The SC will be able to provide many of the materials (or direct contacts for obtaining them) on conceptual approaches, methods, trainings and case studies that will be needed for the analysis and framework development.

**Deliverable 4a:** Plan for analysis and framework development    **Due:** 2 weeks after Deliverable 3b

Working in consultation with the WAM and using preliminary materials provided by the WAM and the SC, the Contractor shall develop a plan for analysis and framework development. The plan shall briefly outline a process and approach for completing the literature review/case study analysis and translating a general framework into a tailored version for coral reef managers. The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 4b:** First draft analysis and list of frameworks  
4a

**Due:** 6 weeks after Deliverable

The first draft literature review/case study analysis – along with a summary list of promising frameworks for tailoring to coral reef management needs -- shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 4c:** Second draft analysis and first draft framework    **Due:** 4 weeks after Deliverable 4b

A second draft literature review/case study analysis, along with a draft tailored framework for coral reefs, shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 4d:** Analysis and second draft framework

**Due:** 4 weeks after Deliverable 4c

A revised tailored framework for coral reefs (supported by adjustments to the analysis if needed), shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week

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<sup>2</sup> The draft guide will be provided by the WAM.

later to obtain feedback and to discuss the agenda for the in-person SC meeting described in Task 5 below.

**Deliverable 4e:** SC Meeting analysis and framework

**Due:** 2 weeks after Deliverable 4d

The Contractor shall submit a “SC Meeting draft” analysis and framework for review by the WAM and the SC and for use at the in-person Working Meeting of the SC in Task 5 below.

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### **Task 5: In-Person Working Meeting of the Steering Committee**

The Contractor shall assist the WAM in organizing and facilitating an in-person meeting of the SC in Washington, DC for 2 days in the spring/summer of 2013. Most SC members are Federal and/or local and will not need travel support; however the Contractor should budget for Contractor staff travel as well as travel for one non-Federal participant from the U.S. west coast. Travel and lodging arrangements shall be consistent with U.S. government travel, lodging, and per diem allowances. The objectives of the SC meeting will be to: (1) discuss the results of the analysis; (2) provide final feedback on the draft framework for coral reefs; (3) develop ideas for creating a workshop exercise to test the framework (see Task 6); and (4) lay out a structure and agenda for the 2.5 day stakeholder workshop (see Task 6).

**Deliverable 5a:** Presentation materials for SC working meeting

**Due:** 2 weeks after Deliverable 4d

Working in consultation with the WAM and in conjunction with completing Deliverable 4e above, the Contractor shall prepare meeting materials including: (1) an agenda for the 2 day meeting of the SC; (2) a powerpoint presentation of analysis conclusions and tailored framework; and (3) discussion questions for SC deliberation. Discussion questions shall focus on: feedback on the coral reef adaptation planning framework; brainstorming on the form and content of an expert elicitation-type workshop exercise to critique and “test” the framework with coral reef stakeholders/practitioners; and developing a structure and agenda for the 2.5 day stakeholder workshop (Task 6A).

**Deliverable 5b:** Attendance at SC working meeting

**Due:** 3 weeks after Deliverable 5a

Appropriate Contractor staff shall attend, present and assist the WAM in facilitating the 2 day working meeting of the SC.

**Deliverable 5c:** SC working meeting notes

**Due:** 1 week after Deliverable 5b

The Contractor shall record notes of the deliberations, discussions and ideas of the SC during the course of the meeting and submit copies to the WAM for review.

### **Task 6: Stakeholder Workshop Exercise and Plan**

Working in consultation with the WAM and using the materials, discussions and feedback from Task 5

above as a starting point, the Contractor shall develop an expert-elicitation type exercise for stakeholders/practitioners to critique and “test” the adaptation planning framework that has been tailored for coral reef management. This exercise shall be part of a workshop plan for a 2.5 day stakeholder workshop to take place in Honolulu, Hawaii in late 2013. Stakeholder workshop logistical support – including venue arrangements, participant invitations and compensation, and onsite registration and coordination -- will be provided under a separate contract. Under *this* work assignment, the Contractor will be responsible for workshop technical design and facilitation.

The goal of the workshop is to explore best practices for “mainstreaming” climate change adaptation principles into coral reef management planning, with a focus on gleaned feedback from coral reef stakeholders/practitioners in the Pacific region. Participants at the workshop shall include approximately 25 experts in coral reef management, coral reef science, and climate change impacts and adaptation assessment science from across Federal agencies, states and territories, non-governmental organizations, and academia. The plan for the workshop, including the workshop exercise and any supporting background materials for the participants to receive prior to the workshop, are to be developed under this task and delivered at least 4 weeks prior to the workshop for electronic transmission to the recipients (mailings and other participant communications are covered under the separate, workshop logistics contract).

**Deliverable 6a:** Outline of workshop exercise and plan **Due:** 2 weeks after Deliverable 5c

An outline of a proposed workshop exercise and plan – including a list of supporting materials to be prepared (e.g., worksheets, spreadsheets, conceptual model, or other appropriate content) -- shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 6b:** Draft workshop exercise, plan and materials **Due:** 4 weeks after Deliverable 6a

A full draft workshop exercise and plan – including all supporting materials -- shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 6c:** Revised workshop exercise, plan and materials **Due:** 4 weeks after Deliverable 6b

A revised workshop exercise, plan and supporting materials shall be submitted for WAM and SC review and feedback. The Contractor shall organize a SC call for one week later to obtain feedback.

#### End Base Period

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#### Begin Option Period 1

**Deliverable 6d:** Final workshop exercise, plan and materials **Due:** 4 weeks after Deliverable 6c

**Deliverable 6e:** Draft workshop presentation materials **Due:** with Deliverable 6d

In conjunction with finalizing the workshop exercise and plan (Deliverable 6d), the Contractor shall work in consultation with the WAM to prepare appropriate presentations to be used in workshop facilitation.

**Deliverable 6f:** Final workshop presentation materials

**Due:** 2 weeks after Deliverable 6e

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#### **Task 7: Facilitation at Stakeholder Workshop on Adaptation Planning for Coral Reefs**

Appropriate Contractor staff will provide technical support at the stakeholder/practitioners workshop for 2.5 days in Honolulu, Hawaii in late 2013. Technical support shall include: (1) either direct or indirect facilitation of the workshop exercise itself; (2) compilation of exercise results; and (3) note-taking of all workshop presentations and discussions.

**Deliverable 7a:** Workshop technical facilitation

**Due:** late 2013 (TBD with WAM)

**Deliverable 7b:** Workshop notes

**Due:** at close of workshop

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#### **Task 8: Lessons Learned Memo and Revised Adaptation Planning Framework and Exercise**

Based on the results of the workshop, the Contractor shall produce a memo describing the workshop exercise results in the form of a “lessons learned” analysis. This then shall be used as the basis for performing any additional revisions to the adaptation planning framework for coral reef managers, as well as suggested changes for future workshop exercises, in preparation for publication (see Task 9 below).

**Deliverable 8a:** Workshop results/lessons learned memo  
7b

**Due:** 4 weeks after Deliverable

The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 8b:** Revised framework and exercise  
8a

**Due:** 4 weeks after Deliverable

The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 8c:** Final framework and exercise

**Due:** 4 weeks after Deliverable 8b

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#### **Task 9: Manuscript**

The Contractor shall prepare a manuscript in the form of a journal article, book chapter, or online case study write-up, as per instruction from the WAM. The manuscript shall be written in clear, concise prose

consistent with the standards of peer-reviewed scientific literature.

**Deliverable 9a:** Draft annotated outline

**Due:** 2 weeks after Deliverable 8c

The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 9b:** Revised annotated outline

**Due:** 2 weeks after Deliverable 9a

**Deliverable 9c:** Draft manuscript

**Due:** 4 weeks after Deliverable 9b

The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 9d:** Revised manuscript

**Due:** 4 weeks after Deliverable 9c

The Contractor shall organize a SC call for one week later to obtain feedback.

**Deliverable 9e:** Final manuscript  
9d

**Due:** 4 weeks after Deliverable

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#### **MILESTONES AND DELIVERABLES:**

<b>Task</b>	<b>Milestone/Deliverable</b>	<b>Due Date</b>
<b>1</b>	<b>1.a: Work Plan and Cost Estimate</b> <b>1.b: Updated QA Plan</b>	Within 14 days of receipt of WA Within 7 days after WP approval
<b>2</b>	<b>Establish communication</b> 2a: Kickoff call 2b: Progress reports	Within 7 days after WP approval Monthly
<b>3</b>	<b>Project Steering Committee Support</b> 3a: Agenda and materials for AC kickoff call 3b: Convene SC with a 2 hour call 3c: Organize monthly feedback calls	1 week after Deliverable 2a 3 weeks after Deliverable 2a TBD with WAM
<b>4</b>	<b>Literature/Case Study Analysis and Draft Adaptation Planning Framework</b> 4a: Plan for analysis and framework development (SC Call) 4b: First draft analysis and list of frameworks (SC Call) 4c: Second draft analysis and first draft framework (SC Call) 4d: Analysis and second draft framework	2 weeks after Deliverable 3b 6 weeks after Deliverable 4a 4 weeks after Deliverable 4b 4 weeks after Deliverable 4c



<b>Task</b>	<b>Milestone/Deliverable</b>	<b>Due Date</b>
	(SC Call) 4e: SC Meeting analysis and framework	2 weeks after Deliverable 4d
<b>5</b>	<b>In-Person Working Meeting of the SC</b> 5a: Presentation materials for SC working meeting 5b: Attendance at SC working meeting 5c: SC working meeting notes	2 weeks after Deliverable 4d 3 weeks after Deliverable 5a 1 weeks after Deliverable 5b
<b>6</b>	<b>Stakeholder Workshop Exercise and Plan</b> 6a: Outline of workshop exercise and plan (SC Call) 6b: Draft workshop exercise, plan and materials (SC Call) 6c: Revised workshop exercise, plan and materials (SC Call) 6d: Final workshop exercise, plan and materials 6e: Draft workshop presentation materials 6f: Final workshop presentation materials	2 weeks after Deliverable 5c 4 weeks after Deliverable 6a 4 weeks after Deliverable 6b 4 weeks after Deliverable 6c With 6d (4 weeks after 6c) 2 weeks after Deliverable 6e
<b>7</b>	<b>Facilitation at Stakeholder Workshop on Adaptation Planning for Coral Reefs</b> 7a: Workshop technical facilitation 7b: Workshop notes	Late 2013 (TBD with WAM) At close of workshop
<b>8</b>	<b>Lessons Learned Report with Revised Adaptation Planning Framework and Exercise</b> 8a: Workshop results/lessons learned memo (SC Call) 8b: Revised framework and exercise (SC Call) 8c: Final framework and exercise	4 weeks after Deliverable 7b 4 weeks after Deliverable 8a 4 weeks after Deliverable 8b
<b>9</b>	<b>Manuscript</b> 9a: Draft annotated outline (SC Call) 9b: Revised annotated outline 9c: Draft manuscript (SC Call) 9d: Revised manuscript (SC Call) 9e: Final manuscript	2 weeks after Deliverable 8c 2 weeks after Deliverable 9a 4 weeks after Deliverable 9b 4 weeks after Deliverable 9c 4 weeks after Deliverable 9d

#### **ACCEPTANCE CRITERIA:**

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be

reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

#### **CONFLICT OF INTEREST:**

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

#### **MANAGEMENT CONTROLS:**

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on all deliverables, with written confirmation of their acceptance required prior to completion of subsequent deliverables.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

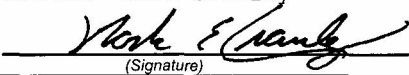
**NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:**

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-06 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period   09/30/2012   To   09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number	Title of Work Assignment/SF Site Name Adaptation Planning for Coral								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW								
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance  From 09/30/2012 To 09/29/2013								
Comments:										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee: \$0.00				LOE:				
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 12/27/2012		Cost/Fee: \$92,824.00				LOE: 696				
Cumulative Approved:		Cost/Fee: \$92,824.00				LOE: 696				
Work Assignment Manager Name   Jordan West							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number   703-347-8584			
							FAX Number:			
Project Officer Name   Sharon Boyde							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number: 703-347-8576			
							FAX Number: 703-374-8696			
Other Agency Official Name							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number:			
							FAX Number:			
Contracting Official Name   Mark Cranley							Branch/Mail Code: <b>CPOD</b>			
 <b>01/22/13</b> (Signature)                      (Date)							Phone Number: 513-487-2351			
							FAX Number: 513-487-2109			

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-07								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2013 Base <input checked="" type="checkbox"/> Option Period Number								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name EnviroAtlas National Hydrolic								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2012 To 09/29/2013								
Comments: Please provide a Work Plan NLT 04/26/2013.										
<input type="checkbox"/> Superfund		Accounting and Appropriations Data								
<input checked="" type="checkbox"/> Non-Superfund		Note: To report additional accounting and appropriations data use EPA Form 1900-69A.								
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE:				
09/30/2012 To 09/29/2013										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		Cost/Fee:				LOE:				
Cumulative Approved:		Cost/Fee:				LOE:				
Work Assignment Manager Name Megan Mehaffey						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number 919-541-4205				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

TETRA TECH  
EP-C-12-060  
Work Assignment 0-07

TITLE: EnviroAtlas National Hydrologic and Landscape Metrics for the Conterminous U.S.

PERIOD OF PERFORMANCE: CO Approval thru September 29, 2013

WORK ASSIGNMENT MANAGER: Megan Mehaffey  
ORD/NERL/LEB/ESD  
109 TW Alexander Drive  
Mail Code: E243-05  
919-541-0620  
E-Mail: [Mehaffey.megan@epa.gov](mailto:Mehaffey.megan@epa.gov)

INTRODUCTION:

The world around us is changing rapidly - economies, populations, and climate are undergoing major transformations, which require new and updated policies that ensure health, safety, and sustainability in the ways humans interact with the planet. To react to these changes in positive, helpful ways, we need a common understanding, across our country and the world, of the natural sciences and engineered developments that affect our lives. The long-term health and well-being of people is tied to the quality of the natural environment and the manmade places around them: the towns, cities, and rural and natural land areas where they live, work, and play. At present, the many goods and services that we get from nature (ecosystem services) are well-known, but not always kept in mind when decisions are made. Often, decisions on development and environmental policy have been made based on incomplete understanding of the interactions between human activities and ecosystem services. For the well-being of present and future generations, we must understand our needs for sustainable practices and ecosystem services.

OBJECTIVE:

EPA's Office of Research Development and its partners are developing a National Atlas for Sustainability. This Atlas will be an online decision support tool that will allow users to view and analyze the geographical distribution of supply, demand, and drivers of change related to natural and built infrastructure at multiple scales for the nation. Explicit relationships between human health and well-being and the services provided by the ecosystem will communicate a full accounting of how decisions affect communities' progress towards sustainability under different scenarios. Through the Atlas users will have access to a suite of the metrics.

SPECIFIC TASKS:

Task 1. The contractor shall prepare and submit a quality assurance project plan (QAPP) addressing the activities for the tasks that follow. Other project-specific document(s) that discuss quality assurance and/or quality control requirements and procedures, may also be submitted to the WACOR for review and approval before work begins on the project so that all parties have a clear understanding of the project goals, the deliverables and schedule for their submission, and the established quality standards that must be met for the intended use of the products.

Task 2. The contractor shall use the newest version of the NHDPlus (CAT3T) tool to calculate a set of 50 metrics for all medium resolution 1:100,000 NHDPlus (Version 2) catchments and streams database for the United States using GIS ArcMap or equivalent. Output can be provided as a geodatabase, coverage, a shapefile or dbf files that include unit identifiers to can be joined to NHDPlus unit identifiers. EPA will provide the necessary gridded data for calculating the metrics including landcover, soils, and landform data. The initial list of 50 metrics the contractor shall calculate will be provided as an excel spread sheet.

Task 3. The contractor shall generate a set of curve numbers for different biophysical areas for each combination of Cropland Data Layer 2010 land cover class/slope/soil type. EPA will provide the necessary gridded data for calculating the metrics including landcover, soils, and landform data. The contractor shall calibrate the CN's using historical gauged stream discharge and precipitation data from within the different biophysical areas. The contractor shall provide low average and high CNs dependent on antecedent soil conditions. The CN to be assigned to water shall be based on whether it is flowing or not (stream vs. reservoir/lake). The contractor shall use the calibrated CN values to estimate runoff for the conterminous US. The contractor shall summarize runoff by 12 digit HUCs provided by EPA.

Task 4. The contractor shall run the riparian tool using the D8 Buffered Flowpath Length Calculator (FLC) for the contiguous United States. The contractor shall use 30m USGS NED for this process which will need to be hydro-enforced (burned in and filled) to match the HND high resolution streamlines. The contractor shall use NHD high resolution stream lines to create stream network raster with 1 (stream) and 0 (all other). The contractor shall use NLCD2006, class 82 – row crop, class 21-24 – combined urban for source inputs and classes 41-71 (forest, shrubland, and grassland) for the forest inputs and class 90 and 95 (wetlands) are to be used for wetland inputs. The contractor shall provide output grids of % agriculture with no buffer, % agriculture with >30 m of buffer, % urban with no buffer, % urban with >30m buffer. These grids should also be summarized by 12-digit HUC. EPA will provide the FLC tool as a ArcGIS.

#### DELIVERABLE DUE DATES

Task #	Deliverable	Due Date
Work Plan	TWP	20 days after receipt of WA
QAPP	Quality Assurance Project Plan	30 days after accepted TWP
Task 2 NHDPlus Metric	First draft of metrics NHDPlus V2 for US	06/31/2013
Task 3 CN numbers	First draft of CN number for various biophysical areas	07/31/2013
Task 4 FlowPath	First draft buffered flow path datasets	08/31/2013
Task 2, 3, and 4	Finalized metrics and data	09/29/2013

**QA/QC REQUIREMENTS FOR WA:** All deliverables will be evaluated as to their quality by the WACOR. Deliverables of unacceptable quality will be returned to the contractor for revision. Spatial data shall meet federal FGDC standards and metadata shall be provided with each deliverable.

#### EPA National Geospatial Data Policy (NGDP)

Whenever practical and applicable, this research shall adhere to the *EPA National Geospatial Data Policy (NGDP)* which establishes principles, responsibilities, and requirements for collecting and managing geospatial data used by Federal environmental programs and projects within the jurisdiction of the U.S. Environmental Protection Agency (EPA). This Policy also establishes the requirement of collecting and managing geospatial metadata describing the Agency's geospatial assets to

underscore EPA's commitment to data sharing, promoting secondary data use, and supporting the National Spatial Data Infrastructure (NSDI). Reference: USEPA. US Environmental Protection Agency, CIO Policy Transmittal 05-022, Classification No. 2121, Policy Title: *EPA National Geospatial Data Policy*, [http://www.epa.gov/nerlesd1/ggc/pdf/epa\\_natl\\_geo\\_data\\_policy.pdf](http://www.epa.gov/nerlesd1/ggc/pdf/epa_natl_geo_data_policy.pdf) August 24, 2005 [URL cited September 29, 2011].

EPA National Geospatial Data Policy Procedure for Geospatial Metadata Management

Whenever practical and applicable, this research shall adhere to the *EPA National Geospatial Data Policy Procedure for Geospatial Metadata Management* which establish procedures, requirements and responsibilities to implement a data life cycle, as defined in the National Geospatial Data Policy (NGDP), for all geospatial metadata used by federal environmental programs and projects within the jurisdiction of the U.S. Environmental Protection Agency (EPA). Reference: USEPA. US Environmental Protection Agency, CIO Policy Transmittal 08-004, Classification No. CIO 2131-P-01-0, Policy Title: *EPA National Geospatial Data Policy Procedure for Geospatial Metadata Management*, <http://www.epa.gov/geospatial/docs/2131.pdf> October 25, 2007 [URL cited September 29, 2011].

REPORTS AND MEETINGS: Periodic conference calls (e.g. every 2 weeks) to review status of the deliverable will be scheduled by EPA.



**EPA**United States Environmental Protection Agency  
Washington, DC 20460**Work Assignment**

Work Assignment Number

0-07

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2013

Base ☒ Option Period Number

Title of Work Assignment/SF Site Name

EnviroAtlas National Hydrologi

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2012 To 09/29/2013

Comments:



Superfund

## Accounting and Appropriations Data



Non-Superfund

SFO  
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

## Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2013

Cost/Fee: \$0.00

LOE: 0

This Action:

\$100,996.00

1,150

Total:

\$100,996.00

1,150

## Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/25/2013

Cost/Fee: \$100,996.00

LOE: 1,150

Cumulative Approved:

Cost/Fee: \$100,996.00

LOE: 1,150

Work Assignment Manager Name Megan Mehaffey

Branch/Mail Code:

Phone Number 919-541-4205

FAX Number:

(Signature)

(Date)

Project Officer Name Sharon Boyde

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

(Signature)

(Date)

Other Agency Official Name

Branch/Mail Code:

Phone Number:

FAX Number:

(Signature)

(Date)

Contracting Official Name Mark Cranley

Branch/Mail Code: CP0D

Phone Number: 513-487-2351

FAX Number: 513-487-2109

(Signature)

05/30/13  
(Date)